

MANAGEMENT AS A SCIENCE OF THE ARTIFICIAL^[1]

Mie Augier

70 Cubberley, Stanford University
Stanford, CA 94305-3096
Phone: (650) 723-9898
Email: augier@stanford.edu

Saras D. Sarasvathy

4548 Van Munching Hall
R.H. Smith School of Business, University of Maryland
College Park, MD 20742
Phone: (301) 405-9673.
Email: saras@rhsmith.umd.edu

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ABSTRACT

In some of his final papers on organization economics, Simon suggested building a new theoretical edifice of organizations and markets based on a “full-bodied” theory of the firm, as opposed to the “skeletal” view currently embraced by economics. The full-bodied firm would, in Simon’s conceptualization, rest upon: (a) the fundamental behavioral assumption of *docility* rather than opportunism; (b) focus on *design* activities of managers as well as on their decision making; and, (c) challenge the ubiquity and exogeneity of markets, making them instead an *artificial* product of human design. In other words, the endeavor he left us with is to begin constructing a behavioral theory of markets.

In the outpouring of appreciation that followed Herbert Simon's death on February 9, 2001, there has been almost complete agreement that he was a towering figure in many twentieth-century developments in science, and his work crossed disciplinary boundaries. This judgment seems to be based on the fact that he significantly shaped the disciplines in which he worked; pioneered developments such as artificial intelligence and behavioral economics; brought ideas such as satisficing and bounded rationality to the limelight. He was celebrated in many corners of academia, including management science, organization studies, and strategy (xxxx) and acknowledged for his pioneering role in the development of behavioral organization theory. But to appreciate in its entirety the work of a man with so many achievements in such disparate fields is not an easy task even for biographers and historians.

To do justice to Herbert Simon and his thought, we need to approach him on his own terms and in the context of his own time, rather than on our own terms and in retrospect. Understanding Herbert Simon we come also to understand something more about the development of the fields he did so much to foster, since we can view these developments through his eyes and from his perspective. We will, furthermore, come to see that he did not care much about differences between the disciplines; preferring instead to emphasize their commonalities. He was unusually firm in his resistance for disciplinary loyalty; "If you see any one of these disciplines dominating you," he said in conversation, "you join the opposition and you fight it for a while." As a result, Simon could appear to be always leaving and never finding home; always embracing a new discipline with passion and intensity, but at the same time always appearing to be moving away. In keeping with this perspective, Simon never really joined an established disciplinary community, preferring instead to establish his own domains (such as behavioral science, cognitive psychology, artificial intelligence). Domains which were close

enough to mainstream disciplines to allow recognition, yet different enough to not expecting Simon to be its follower. For, how can you follow, when your instinct is to lead?

It was this instinct to be independent and to be different, in addition to an enormous intellectual curiosity, which allowed Simon to be so broad in the scope of his research, while at the same time emphasizing the same problem in all his work. Simon was especially concerned with reforming disciplines that had an unrealistic conception of human decision making, and particularly with representations of rationality, a concern central to many of the disciplines in which he was particularly interested. One key to Simon's work is consequently his effort to work out his own analysis of decision making at several disciplinary as well as analytical levels. To an unusual degree, Simon's mind was comfortable with both the very concrete and the highly abstract, and he leapt readily from one to the other and back again, without spending much time in the middle where most of us live. His mind was a mind at once preoccupied with the historical instance and the big picture. As a man and a scientist, his mind was always seeking to derive models of human behavior, be they verbal, mathematical or analogical (Simon, 1954).

But he wanted models which could provide concrete expressions about human behavior. As a result, the dynamic character of Simon's mind and personality can at least in part be traced to the dialectic relationship between the two sides of his interest. On the one hand, he was a man of science who dreamed of a better world with scientific models and he first entered the domain of social science with the ambition of spreading the use of mathematics, thinking that the fields of social science needed a little "stiffening up." On the other hand, those models should correspond to the empirical realities of the real world. For instance, to Simon, mathematics was a language that could add considerably to the social sciences, if it was empirically sound, but if it was *not* empirically sound, it didn't matter that it was good mathematics, for it was not enough

that it was logically consistent. Another man might have handled the possible tension between admiration for models, and the need for “the empirical” by compartmentalization, but Simon found bounded rationality and managed to channel the tension into an unusually productive program of research. In effect, Simon’s interest in the empirical tied him to the mast, like Ulysses, and enabled him to attend the siren song of economics without losing the critical distance so vital for interdisciplinary and empirical inquiry.

When asked toward the end of his life, what he would do differently if he had to live his intellectual life over again, he said that he would start with “Organizations and Markets” and proceed forward to an understanding of economics and management. In particular, he felt he had not challenged the ubiquity of markets (i.e. markets exist and organizations have to be explained orthodoxy) enough in his work. It was typical of the man that he would always start where he was and proceed into the future. In that spirit of setting forth on the basis of limited information, we ask ourselves in this paper, if we begin with latest work in management and economics, where would we go next?

Our tentative answer is a simple equation:

Theory of the full-bodied firm + Management as a science of the artificial = A behavioral theory of markets

We will now proceed to elaborate upon each of the terms on the left hand side and hopefully make a case for the right hand side.

THE FULL-BODIED FIRM

In the final pieces of his work on organizational economics (Org & Mkts, Simon, 1997; Sarasvathy & Simon, 2000), Simon challenged at least three features of current theorizing and emphasized the role of design (as opposed to decision) in the creation and management of organizations. In particular, he challenged:

- Behavioral assumptions of opportunism – and introduced the notion of “docility”
- The ubiquitous nature of markets – and focused instead on their “artificial” nature.
- Skeletal views of the firm – and emphasized the importance of “design” over “decision”

Docility, instead of opportunism

Perhaps the most quoted passage from Adam Smith, one that permeates modern economics, is: *It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest.* With characteristic depth and simplicity, by examining *The Wealth of Nations* in greater detail, Simon shows that behavioral assumptions of opportunism that underlie models of “rationality” in economics today do NOT draw upon Smith. Instead as Simon notes, “Thus, the fundamental psychological assumptions of *The Wealth of Nations* are that, because of their dependence, human beings see the advantage to be gained from the help of others; and because of their selfishness, they enter into mutually beneficial bargains. The term “rationality” does not enter explicitly into this discussion, and the concept enters only to the extent that effective selfishness depends upon being able to judge where self-interest lies.” (underlines added by us)

In other words, the existence of self-interest is a key component of the necessity to persuade others and not a fundamental behavioral assumption. Simon further develops this insight into Smith by formulating the concept of “docility” as: *The tendency to depend on suggestions, recommendation, persuasion, and information obtained through social channels as a major basis of choice* (1993: 156). He further clarified, “We are highly susceptible to social influence and persuasion, a susceptibility that I will call docility. I use the term “docility ” here in its sense of teachability or educatability -- not in its alterative sense of passivity or meekness” (1997: 41).

Docility follows directly from the limitations of human cognition – i.e. that as a species, we are at best, boundedly rational. Simon developed a notion of “intelligent” altruism based on this notion of docility to argue that bounded rationality not only limits our ability to undertake the computational demands of highly opportunistic behavior, but also selects such behavior out (in an evolutionary sense) and selects in those who are willing and able to depend on others and help sustain others in a group. More recently, Knudsen (2002) has argued for the role of docility in the emergence of altruism in biological populations. The case for the evolutionary dominance of intelligent altruists is also well-argued from perspectives other than those resting on docility. Hill (1990) for example shows that under the normal assumptions of neo-classical economics, the invisible hand of the market will tend to weed out persistently opportunistic behavior. Also, without resorting to evolutionary arguments, Adam Smith himself had made the case for the fundamental behavioral assumption of persuasion in all economic exchanges:

"Different genius is not the foundation of this disposition to barter which is the cause of the division of labour. The real foundation of it is that principle to persuade which so much prevails in human nature... We ought then to mainly cultivate the power to persuasion, and indeed we do so without intending it. Since the whole life is spent in the exercise of it, a ready method of bargaining with each other must undoubtedly be attained." (Smith, 1978: 493-494)

Thus, both for Simon and Smith, docility is a more useful construct as a basis for understanding human behavior than either opportunism or altruism. It is important to note here that the notion of docility is a two-way construct. Docility insists that *both* parties to any interaction are persuadable and persuasive to varying degrees about different things. And that is why docility can form the basis of understanding not only how people strike bargains about things they *know* they want, but also about things they may be ambiguous about. Docility not only allows *trade-offs* in extant and clearly specified preferences, but allows not-yet-existent preferences to be *constructed* in the very process of trade. We will incorporate some of the

positive consequences of this bi-directional aspect of docility in our discussion of the creation of new markets through effectuation later in the paper.

Artificial, rather than ubiquitous markets

We mentioned earlier the Ulysses analogy to Simon tying himself to empirical reality in all his theorizing, even in his most speculative efforts. That analogy is once again compellingly illustrated in the following passage where he passionately argues against the absurdity of a market-centric view of economics:

During the Siena lectures it occurred to me that, contrary to what I was hearing, the lives of most people in a modern industrial society are not spent mainly in markets, but in the interiors of individual firms. Eighty per cent or more of the working population is employed by firms, and only a small fraction of these have direct contact with the firms' markets to any significant extent. Their working lives are spent largely well inside the skin of the firm.

...

It occurred to me also that any creature floating down to our Earth from Mars would perceive the developed regions to be covered mostly by firms, these firms connected by a network of communications and transactions that we know as markets. But the firms would be much more salient than the markets, sometimes growingly sometimes shrinking, sometimes dividing or even swallowing one another. Surely they would appear to be active elements in the scene. How curious, in the light of this predominance of firms, that in economics we describe the firms as small skeletal structures embedded in the network of markets, rather than describing markets as threads that link robust firms.

These speculations have led me to consider how an organization-centric picture of the economy would differ from a market-centric picture (Simon, 1991). A major difference is that the real-world firm would have much more flesh on its bones than the firm of neoclassical economics. The latter is pretty much summed up by a production function and an entrepreneur, who makes decisions by comparing costs of production with the prices at which the corresponding amounts of product could be sold. The system is almost all skin, in direct contact with the market.

The firm or organization theory is a quite different affair. It contains a complex system of behavior in its interior, and a large part of its management's time is spent in assuring that its vital organs are functioning properly.

If we begin with this theoretically topsy-turvy, but empirically realistic world of active full-bodied organizations, that can “in close resemblance to a colony of algae -- be viewed as one organism or a multitude,” what can we say about the nature of markets? For a long time, the bulk of economic activity has been modeled as decision problems, even in a substantial part of Simon’s work. Whether they are formal models for optimization, or collections of heuristics for search and satisficing, *decisions* have permeated theorizing and empirical investigations in economics and management. But over several decades of studying human problem solving, Simon began to realize the importance of *the artificial*, i.e. processes and consequences of human *design* in addition to the products and processes of human choice. It is in modeling management as a science of the artificial that we begin to appreciate the differences between design and decision and the implications of those differences for the way we think about markets.

Design, as well as decision

Simon outlined the beginnings of a theory of management as a science of the artificial when he wrote, “The design of products (and not just the choice of products) is often a central concern, and marketing procedures, manufacturing procedures, pricing policies, the central organization structure, even long-term strategies are designed, and not just chosen. Design calls for initiative, focus of attention on major problems, search for alternatives. One cannot choose the best, one cannot even satisfice, until one has alternatives to choose from.”

Nowhere is this clearer than in the *entrepreneurial* activities of organizations. For as Simon continues, “Especially in the case of new or expanding firms, the entrepreneur does not face an abstract capital market. He or she exerts much effort to induce potential investors to share the company’s views (often optimistic) about its prospects. This executive is much closer

to Schumpeter's entrepreneur than to the entrepreneur of current neoclassical theory. Whether the firm expands or contracts is determined not just by how its customers respond to it, but by how insightful, sanguine and energetic its owners and managers are about its opportunities - by how much they possess of the "animal spirits" that Keynes was obliged to introduce into his account of the trade cycle (Nelson and Winter, 1982). (1997: 35 & 36)"

Simon further notes that the notion of "market" as self-adjusting mechanism is NOT enough to explain how real world markets or organizations actually function, "Nor does this self-adjusting system have much to do with the information that the firm must gather in order to carry out the numerous search and design activities mentioned earlier. A study of the allocation of management time would almost certainly show that it is the latter that account for most of the managers' days" (1997: 37)

It is perhaps not a coincidence that one of the very last theses Simon supervised consisted of an investigation into entrepreneurial expertise (Sarasvathy, Simon & Lave, 1998; Sarasvathy & Simon, 2000; Sarasvathy, 2001a & b). It is in the study of entrepreneurship that we find clear evidence of how procedural rationality operates in a domain of high environmental uncertainty and high goal ambiguity. Entrepreneurship exemplifies management as a science of the artificial, where the role of docility, design, and the artificial nature of markets stand out in stark relief.

MANAGEMENT AS A SCIENCE OF THE ARTIFICIAL

The essence of studying management as a science of the artificial, then, would entail paying close attention to those activities within the organization that involve *design*, in addition

to the more familiar focus on decision making and problem solving. In *Sciences of the Artificial*, Simon laid out several characteristics of an artifact, including:

- Natural laws as constraints on, but not determinants of design
- The necessity for non-predictive mechanisms in design
- The overarching importance of locality and contingency in design
- The role of near-decomposability in the architecture of complex designs
- The addition as well as the breaking of constraints in good design

Many of these aspects are already being studied by scholars in management and strategy.

For example, (at least four key examples to be included here – such as Earl; Porac; Lounsbury; Miner). What is lacking, and therefore an important next step in our endeavors, is the attempt to synthesize these studies into an actual branch of management – a management science that focuses on the *differences* between natural science and a science of the artificial rather than one that seeks to imitate the natural sciences; one that constructs its theories on the contingent nature of artifacts than seeks to discover them by searching for law-like regularities and immutable predictions.

One such theory that is rooted firmly in the ideas about the design of artifacts detailed thus far is one that Simon himself guided in its infancy. This theory, named effectuation to signify the inverse of causation, is being developed by a group of researchers (Sarasvathy, Dew, Read, and Wiltbank, 2003) in entrepreneurship. Effectuation, as a form of procedural rationality, serves to integrate several elements that Simon introduced in his late work, including docility, design, near-decomposability, locality and contingency – and the overall notion of ‘the artificial.’ We briefly outline the theory and use it illustrate how a management science of the artificial may lead to a theory of how new markets come to be – i.e. a behavioral theory of markets.

DOCILE DESIGNS AND EFFECTUAL ARTIFACTS

Effectuation embodies a sequence of *non-predictive* strategies in dynamic problem-solving that is primarily *means-driven*, where goals emerge as a consequence of *stakeholder commitments* rather than vice versa. Most important, effectuation isolates, identifies, and exploits techniques that *seek to control the future* without having to predict it.

Hence the key to effectuation lies in our ontological stance toward the future. The simple but familiar device consisting of urns and balls used to describe statistical distributions should clarify this stance. In particular, the example we use here is due to Frank H. Knight, who argued in his seminal *Risk, Uncertainty, and Profit*, that the existence of and justification for entrepreneurial profit was entirely due to the existence of “true” uncertainty (Knight, 1921). Knight divided unknown distributions of the future into three types:

(In each of the following cases imagine a game where if you draw a red ball, you win \$50)

(1) *Risk – Known distribution, unknown draw:*

The urn contains 5 red balls and 5 green balls. In this case the expected value (\$25) of any draw is perfectly calculable through standard statistical analysis.

(2) *Uncertainty – Unknown distribution, unknown draw:*

We do not know how many balls are in the urn or of what colors. Here we need to estimate the distribution over several draws before we can place our bets with any degree of confidence.

(3) *“True” or Knightian uncertainty – Distribution does not exist and/or is unknowable:*

Each draw brings forth a different item, not limited to balls – in other words, we just simply do not know and cannot estimate what the urn contains. It is here that we need a non-predictive technique to make decisions. Effectuation suggests that one solution to this problem lies in understanding that this distribution is *created* through human action; hence, *harnessing* human action through a process of persuasion^{2[2]} is likely to prove more useful than *predicting* it.

Effectuation brings into stark relief the predominant ontological stance of most of the literature on decision-making under uncertainty. Efforts in this stream of research have almost exclusively been dedicated to causal analyses that lead to improved predictions precisely because

^{2[2]} This persuasion is bi-directional – i.e. both leader and member are persuadable and persuasive. That is why, as we explain later, flexibility of goals is such an important aspect of effectuation.

good prediction allows us to capitalize on our expectations regarding the future. But focusing so much on causal, and hence, predictive aspects, we have mostly neglected the study of techniques of control that do not require us to predict the future. Take for example, Kahneman and Lovallo's pitiful head-shaking at the folly of human attitudes to the future that lead to "timid choices and bold forecasts." The authors simply assume that subjects should always approach the future as predictable, and confidently prescribe "corrective" actions that need to be taken to "overcome the biases" and achieve "optimal behavior in every situation" (Kahneman & Lovallo, 1993). We agree with Kahneman and Lovallo that there are several circumstances where people disregard predictive information, sometimes leading to over-optimism in their forecasts, and sometimes to exaggerated risk-aversion. But in cases where there are good reasons to approach the future as truly unknowable, merely focusing on better prediction may not be useful, or even meaningful. This is particularly true in domains of design, whether the design involves physical or social artifacts. As we mentioned earlier, (Simon, 1996) forcefully argues this point in seminal book, *Sciences of the Artificial*, as follows:

Since the consequences of design lie in the future, it would seem that forecasting is an unavoidable part of every design process. If that is true, it is cause for pessimism about design, for the record in forecasting even such "simple" variables as population is dismal. If there is any way to design without forecasts, we should seize on it.

One of the most telling examples of a domain where the future may be truly unknowable is the introduction of a new product in a new market; the "suicide" quadrant in Figure 1. In commercializing new technologies, pioneering entrepreneurs often find that formal market research and expert forecasts, however sophisticated in their methods and impeccable in their analyses, fail to predict where the markets will turn out to be, or what new markets will come into existence. Christensen (1997), Mintzberg (1994) and others have documented a wide variety of cases that illustrate this unpredictability in business. Human history also attests to this

unpredictability in other areas – such as Columbus’ discovery of the New World, the fall of the Berlin Wall, or the organization of Mothers Against Drunk Driving. In each of these cases, causal maps were either non-existent, or less useful than effectual action.

But even in more mundane businesses such as ice cream (Lager, 1994) or real estate (Corcoran & Littlefield, 2003), means-driven non-predictive strategies have enabled entrepreneurs such as Ben Cohen, Jerry Greenfield and Barbara Corcoran to create new niches and new ways of doing business that turned out to be highly profitable. Both enterprises were spun from the narrow silk of who the founders were, what they knew and whom they knew, and negotiated into widening webs of loyal stakeholders who actively participated in what was to come, and were not merely passive harbingers of the entrepreneurs’ good fortunes. Ben & Jerry, for example, started an ice-cream shop in Vermont because there was little else they knew how to do. And they paid stakeholders, plumbers and pianists alike, with coupons for free ice cream and the chance to participate in a variety of “hippie-style” causes, from the purity of the ingredients in the product to the purity of the environment at large. Barbara Corcoran quit her job as a diner waitress and with a \$1,000 investment from her boyfriend, started a real estate firm in New York and grew it into a \$2 Billion business. In a recent book advocating lessons learned from her experience, she lists such effectual principles as, “If you don’t have big breasts, put ribbons on your pigtails” and “It’s your game, make up your own rules” – emphasizing both the means-driven and non-predictive control aspects of effectuation. Not only in the bromides of successful entrepreneurs, but in a wide variety of actual strategies used in the histories of new ventures, we find evidence that entrepreneurs, whether they ultimately succeed or not, do behave as though human action shapes future outcomes, rather than as though outcomes could be

predicted and those predictions exploited. Table 1 provides a quick list of contrasting elements in the two approaches as they are manifest in entrepreneurial phenomena.

It is important to note here that effectuation is rooted in the reality of who the effectuator is, what he or she knows and whom he or she knows. In fact, the effectuator's imagination is very much moored to the actual world and is tethered firmly to it through the constraints of its means. Yet, the deliberate heeding of these constraints allows the effectual imagination to transform them into opportunities for novelty, particularly the generation of novel ends.

Figure 2 describes the process through which the effectual entrepreneur transforms an idea into a social artifact in the face of substantial external unpredictability, and considerable internal goal ambiguity, while continuing to be tethered to the actual world. The effectuator is modeled at all times as a bundle of primitives consisting of who he is, what he knows and whom he knows. Who he is consists of a collection of tastes, traits, values and abilities; what he knows includes the knowledge corridors he is in; and whom he knows is embodied in the social networks he is a part of. It is important to note here that each of these primitives may be relatively stable in the short run but is liable to change over time. No assumption is made with regard to the structure or intensity of any of these primitives except to note that they are mutable to varying degrees at various times. In other words, at any given point in time, an individual may have some clear and ordered preferences and some vague and unarticulated aspirations. Similarly, he or she might have certain areas of knowledge and experience, but be capable of others that may be latent or non-existent. Their networks may consist both of strong and weak ties, and in some cases they may find themselves in garbage cans^{3[3]} (March. 1994).

^{3[3]} Garbage cans refer to places of routine gatherings where one may or may not meet strangers. Examples include conferences, churches, and airports.

The existence of variation in structure and intensity of these primitive elements of the constitution of individuals makes trading in these very same elements possible. For example, the fact that some stakeholder preferences are vague and malleable means that the entrepreneur can shape those malleable preferences to align with key stakeholders' strong ones so that the two can reach agreement on what the world should look like. And vice versa. Furthermore, to the extent that there is diversity in knowledge bases and both weak and strong ties in networks, entrepreneurs and stakeholders can interact and negotiate new combinations of knowledge and social influence that can lead to true novelty – something neither party may be able to predict or even imagine *a priori*. The existence of docility, therefore, enables the creative trade between individual efficacies to generate new possibilities for the world. And this process of re-creating the world operates through the commitments that each stakeholder brings to the table as cost and price for the negotiations.

Figure 2 traces this process as follows: Based on who she is, what she knows, and whom she knows, the effectuator generates a set of possible actions (actions for which she has high levels of self-efficacy^{4[4]}) and starts interacting with people in her environment. Because both she and her potential stakeholders are docile, they are able to compare aspirations and abilities, debate the possibilities that they envision, and begin negotiating features of the project. Note that at this stage, both outcomes and returns to outcomes are vague and unpredictable at best. So the content of the negotiations are focused on the nature and characteristics of the project (i.e. what the pie may look like) rather than the type and quantity of returns to the project (i.e. the size and distribution of the pie). But depending on what the stakeholders are willing to commit to

^{4[4]} Self-efficacy is a narrower and more context-specific construct than locus of control. As Gist puts it, “internal versus external locus of control is a generalized construct covering a variety of situations, whereas self-efficacy is task-specific, examining the individual’s conviction that he or she can perform a specific task at a specific level of expertise (Gist, 1987). In other words, as Bandura (1977) argued, an individual with a high internal locus of control in general may still exhibit low self-efficacy on particular tasks.

any possible common project and what they negotiate in return for their commitment, a chain of means and goals available to the stakeholders begins to form. Assuming that this chain grows unbroken for a meaningful period of time, two cycles of consequences are set in motion: one is a widening cycle that increases the pool of resources available to the growing stakeholder group; the other is a converging cycle that pushes the growing group toward increasingly specific goals that become more clearly defined and less flexible as the social artifact coalesces into being.

In this effectual process, the social artifact, whether a firm or market or organization or institution becomes in many cases an embodiment of novelty, taking on a shape often unanticipated and sometimes even unimagined by the stakeholders whose commitments actually gave birth to it. For a detailed empirical examination how this process worked in the creation of the RFID industry, see Dew (2003). We posit that case studies and early stage histories of most successful entrepreneurial ventures, whether in the for-profit or social sectors should provide compelling evidence for how this process operates and why it leads to novelty, without resorting to explanations based either on mysterious intuitions, super-normal foresight, or meaningless random walks.

Figure 3 integrates our discussion thus far into a typology of problem-solving strategies organized along the two differing assumptions about the (1) predictability, and (2) controllability of the future. In essence, when we believe the future is highly predictable, we either try to avoid negative outcomes (risk-averse strategies), or use our predictions to control the future using scientific strategies. Examples of the former include portfolio diversification in finance or preventive health care. Examples of the latter include a variety of new technologies such as air-conditioning and medical treatments. High-prediction strategies work well in natural environments or at the population level of analysis in human behavior. In social environments,

where individual, and group-level behaviors matter most, we need strategies that do not fatally depend on predictive calculi. In other words, when we believe the future is not very predictable, we either; (1) try to adapt to a changing environment – i.e. take up boundary scanning activities, seek and use iterative feedback, learn to imitate our best competitors, etc. – or (2) effectuate a new environment – i.e. actively seek to influence, enact and even re-create our environment through stakeholder commitments.

THREE VIEWS OF ORGANIZATIONS AND MARKETS?

In his award address at the 102nd Annual Convention of the American Psychological Association, Paul Slovic (1995) introduced us (metaphorically) to three baseball umpires – who serve as perfect ambassadors for the three views of rationality that we plan to discuss below:

- “I call them as I see them,” says the first;
- “I call them as they are,” claims the second; and,
- “They ain’t nothing till I call them,” argues the third.

In his interactions with the world, the first umpire relies on careful observation; the second, on direct experience; while the third strives to construct it. Slovic goes on to affirm and discuss the third in particular; many of his arguments, applied to empirical work in entrepreneurship, form the basis of inspiration for our claims in this paper so far.

If we translate the three umpires into ontological bases for different types of rationality – i.e. different ways to act upon the world and reason about it – our thesis might look somewhat like this in snapshot:

Causal: The actual world is one of many possible worlds – let’s learn to pick the best one.

Ecological: The actual world is the only one that matters – let’s make the best of it.

Effectual: All possible worlds lie within the actual^{5[5]} – let’s create new ones.

Without venturing too far into the treacherous waters of a philosophical debate, we would like to briefly describe each type of rationality within the restrictions of our domain of interest – i.e. entrepreneurial expertise as a subset of human problem solving. In this narrow domain, the three views of rationality take three different forms of problem structure, particularly in the structure of *constraints*. Further, they imply different strategies with regard to dealing with those constraints.

Todd & Gigerenzer (2003), describe the nature and role of constraints in the case of traditional (causal) rationality as follows:

The traditional view has been that we are hemmed in by two unrelated sets of bounds: purely external ones, such as the costs of searching for information in the world, and, independently, purely internal constraints, such as limits on the speed with which we can process information and limits on the amount of information we can hold in working memory (e.g., Simon, 1981, Chapter 3). Given these constraints, bounded rationality can be seen either as the attempt to do as well as possible given the demands of the world – the notion of optimization under constraints – or as the suboptimal outcome of the limited cognitive system – the realm of irrationality and cognitive illusions.

They then go on to explicate the same for ecological rationality:

These two blades – the two sources of bounds on our rationality – must fit together closely for rationality to cut. While the external bounds may be more or less immutable from the actor’s standpoint, the internal bounds comprising the capacities of the cognitive system can be shaped, for instance by evolution or development, to take advantage of the structure of the external environment (Todd, 2001). From this perspective, then, we can see bounded rationality as the positive outcome of the two types of bounds fitting together. In other words, humans exhibit ecological rationality (Gigerenzer, Todd, & the ABC Research Group, 1999; Todd & Gigerenzer, 2000; Todd, Fiddick, & Krauss, 2000) – making good decisions with mental mechanisms whose internal structure can exploit the external information structures available in the environment.

In other words, while causal rationality seeks to find the best possible world given internal and external constraints that limit its achievement of this optimal objective, ecological rationality seeks to make the most of the actual world by trading off these constraints against each other – either through evolution or Lamarckian learning. Effectual action, in its turn,

^{5[5]} This is a direct quote from Nelson Goodman’s *Fact, Fiction and Forecast*.

pushes this trade-off further to stand the notion of “constraint” on its head, modeling it as “opportunity” – not to create new ways to achieve given ends, but to create new ends – some good, others bad, but all in line with a variety of human aspirations that change over time. The effectual actor seeks to solve *several* distinct problems in the *absence* of firm trade-offs or values, a la the decision maker in Krantz (1991)^{6[6]} who argues, “The normative assumption that people *should* maximize *some* quantity may be wrong... People do and should act as *problem solvers, not maximizers*, because they have many different and incommensurable... goals to achieve.” Effectuation, as a theory, examines and explains *how* people come to have a variety of goals and how these diverse and even conflicting goals may change and converge over time into commitments to particular projects that end up re-creating the world through new social artifacts.

Gregory, Lichtenstein, et. al. (1993) argued that while traditional scholars of rationality dig like archaeologists to “uncover” pre-existing preferences and values, scholars of a rationality based on constructed preferences would function as architects, “working to build a defensible expression of value.” So too the effectual entrepreneur does not undertake formal market research to *discover* the shape of a pre-existent or latent market; instead he or she seeks to *negotiate* stable structures through stakeholder commitments that eventually get stitched together into a market. Similarly, effectuation differs also from adaptationist views of the market. As Lewontin (1992) has argued so well, “We must replace the adaptationist view of life with a constructionist one. It is not that organisms find environments and either adapt themselves to the environments or die. They actually *construct* their environment out of bits and pieces.” Effectuation, we suggest, is what Lewontin calls *a reverse-Lamarckian position*. “Whereas Lamarck supposed that changes in the external world would cause changes in the internal structure, we see that the reverse is true.”

^{6[6]} This passage is also quoted in Slovic (1995)

In Table 2, we outline at least three views of organizations and markets that can serve as alternate frames of reference for our theorizing and research designs. These three views are not mutually exclusive. Instead, they are useful at different times for different purposes. Nevertheless, the differences between them are likely to prove as seminal as any linkages or overlaps in sparking new research and insights into our understanding of management as a science of the artificial. As Loasby argues, partitioning knowledge bases into meaningful categories is a crucial generative source of useful conjectures in any science^{7[7]}.

CONCLUSION: A BEHAVIORAL THEORY OF MARKETS?

We started the paper with a tribute to Herbert Simon on his vast contributions as also his ability to straddle several disciplines without being sucked into any one of them for too long. But we also hoped to extend his work and suggest a new direction for research. We would now like to plead the case for the construction of a behavioral theory of markets as that new direction. The pivot on which our argument turns consists of the following question: We have ample evidence for the concept of “markets” based on equilibrium perspectives (Walras; Arrow; Schumpeter; Kirzner); and on evolutionary/adaptation perspectives (xxxx); what would a conceptualization of markets based on a reverse Lamarckian/effectual perspective look like?

We are not, of course, the first to raise this issue. As Olson and Kahkonen (2000: 1) put it, “The fourth primitive of economic thought – and of most lay thinking on economics – is so elemental and natural that it is usually not even stated explicitly or introduced as an axiom in formal theorizing. It is the half-conscious assumption that markets are natural entities that emerge spontaneously, not artificial contrivances or creatures of governments.” Demand is not

^{7[7]} He also cautions us, however, that we need to periodically overcome those categories to form new syntheses if the cumulation of knowledge is to move forward in any valuable direction. Even as we emphasize our typology in Table 2, we are at all times very mindful of this need for balance.

an atemporal and *naturally existing* manifestation of our needs, wants, and desires that is “out there” waiting to be “discovered”. In other words, *De Gustibus* is not *non disputandum* – i.e. preferences (and consequently demand) are not exogenous to the economic process (Becker and Stigler, 1977, Hirschman 1985, Carpenter and Nakamoto 1989).

Several scholars and bodies of literature attest to the endogenous nature of supply and demand in economic processes. As early as 1942, Schumpeter pointed out that it was not enough for a manufacturer to invent and supply soap: if there is to be a market for soap, the demand for soap also had to be invented i.e. people have to be educated and induced to wash. Much scholarship in evolutionary economics has been motivated by similar observations and has sought to build a picture of technological change in the supply of products that is consistent with empirical observations of the origination and evolution of markets over time (Nelson and Winter 1982). There is a rich stream of literature on technology “push” and “pull” – supply-side and demand-side influences on the evolution of technology regimes. For an excellent review of the issues, see Dosi (1982).

A theory of the creation of demand for products and services must be similarly consistent with empirical observations about the origin and evolution of markets and recognize the interdependence between production and preference formation (Gualerzi 1998). In other words, demand theory must reflect the new opportunities for consumption that are created by new sources of supply. This interaction between endogenously created supply and endogenously created demand is an important issue in our understanding of the role of new markets and, indeed, the nature of competition itself.

The key idea here is that while individuals have abstract aspirations, there are diverse and plural ways in which these aspirations can be fulfilled (Lancaster, 1971). And what makes this

even more complex is that these aspirations can themselves change over time as the individual learns and interacts with other individuals. Aspirations do not in themselves entail any single or inevitable set of “demands” in the conventional economic sense. Instead, individuals have only a very rough idea of their consumption goals. For example, the fact that people experience hunger does not imply a demand for hamburgers, let alone a “market” for the hamburger supplied by any particular fast food chain or restaurant. The transformation of an abstract aspiration such as hunger into particular market niches for particular foods and their suppliers usually involves effectual processes on the part of both suppliers and consumers. In most cases, since markets for food in general are very well understood, the manufacturer can induce people to try new food products through several marketing and promotional techniques including free samples. But even in this relatively mundane industry, new markets also get created through more subtle effectual processes. For example, the founders of Starbucks opened their first shop only as an outlet for selling fresh roasted and ground coffee beans from around the world, mostly since they themselves were coffee aficionados. Only requests from walk-in prospects for trying out the coffee in the shop led them to the idea of a coffee shop such as the modern Starbucks Coffee shops. Even armed with the knowledge about existing markets of coffee drinkers, no one could have predicted ex-ante the market for Starbucks. That market had to be created through a transformational process that involved the interaction of tentative sources of supply and demand that over time coagulated into a familiar shape that we all recognize as a “market” for specialty coffees and coffee culture (Vishwanath and Harding, 2000).

To put it in a nutshell, in a reverse Lamarckian/effectual universe, Needs, wants and desires \neq Demand; and, Demand \neq Supply \neq Market. The relationships between supply and

demand are circular, interactive and contingent rather than linear, unilateral and inevitable (Earl, 1998). In such a universe, what would a science of management look like?

It is obvious that we have not provided any final answers to this question. Indeed, it was our intention merely to make the question as clear and compelling as possible. As for the pursuit of possible answers, we are satisfied to quote Simon on a high note of optimistic excitement:

We should not be disappointed that we have not reached final answers. If we achieved that, we would all no longer be employable as scientists, and that would be unfortunate. But we need not worry. We will continue to have these debates, but we will also continue to have a Whiggish, progressive theory of science. What we are debating today is beyond what we were debating 30 years ago, or even 2 years ago. There is progress in science, and there will be continuing progress in the science of economics. (188)

And the science of management, if we might add.

TABLE 1: SUMMARY OF DIFFERENCES BETWEEN PREDICTION AND EFFECTUATION

ISSUE	CAUSAL OR PREDICTIVE POSITION	EFFECTUAL POSITION
<i>View of the Future</i>	Prediction. The future is a continuation of the past; can be acceptably predicted	Creation. The future is contingent on actions by willful agents
<i>Givens</i>	Goals are given	Means (Who I am, what I know, and whom I know) are given
<i>Decision Agenda</i>	What means ought I to accumulate to achieve these goals?	What effects can I create with the means I have?
<i>Basis for Commitment</i>	Should. Do what you ought to do -- based on analysis and maximization	Can. Do what you are able to do – based on imagination and satisficing
<i>Basis for Taking Action</i>	Goals. Let goals determine sub-goals, commitments, and actions	Means. Let stakeholder commitments and means determine sub-goals – goals emerge through aggregation of sub-goals
<i>Predisposition Toward Risk</i>	Expected Return. Calculate upside potential and pursue (risk adjusted) best opportunity	Affordable Loss. Calculate downside potential and risk no more than you can afford to lose
<i>Attitude Toward Outside Firms</i>	Competition. Constrain task relationships with customers and suppliers to what is necessary	Partnership. Build YOUR market together with customers, suppliers and even prospective competitors
<i>Underlying Logic</i>	To the extent we can predict the future, we can control it	To the extent we can control the future, we do not need to predict it

Table 2: Three Views of Organizations and Markets

Slovic's Umpires	I call 'em as I see 'em	I call 'em as they are	They ain't nothing until I call 'em
Preferences	Observed	Traded	Constructed
Constraints	Constraints as limitations	Constraints as resources	Constraints as opportunities
Phenomena	Economic	Strategic	Entrepreneurial
Process	Equilibrium	Adaptation	Effectuation
Techniques	Optimization	Evolutionary - Darwinian/Lamarckian	Artificial - Reverse Lamarckian
World Views	The actual is one of many possible worlds; <i>Let's pick the best one</i>	The actual world is all there is; <i>Let's make the most of it</i>	All possible worlds are within the actual; <i>Let's make new ones</i>

The three views are not mutually exclusive;

they are useful under difference circumstances for difference purposes

Figure 1: Example of a domain for effectuation

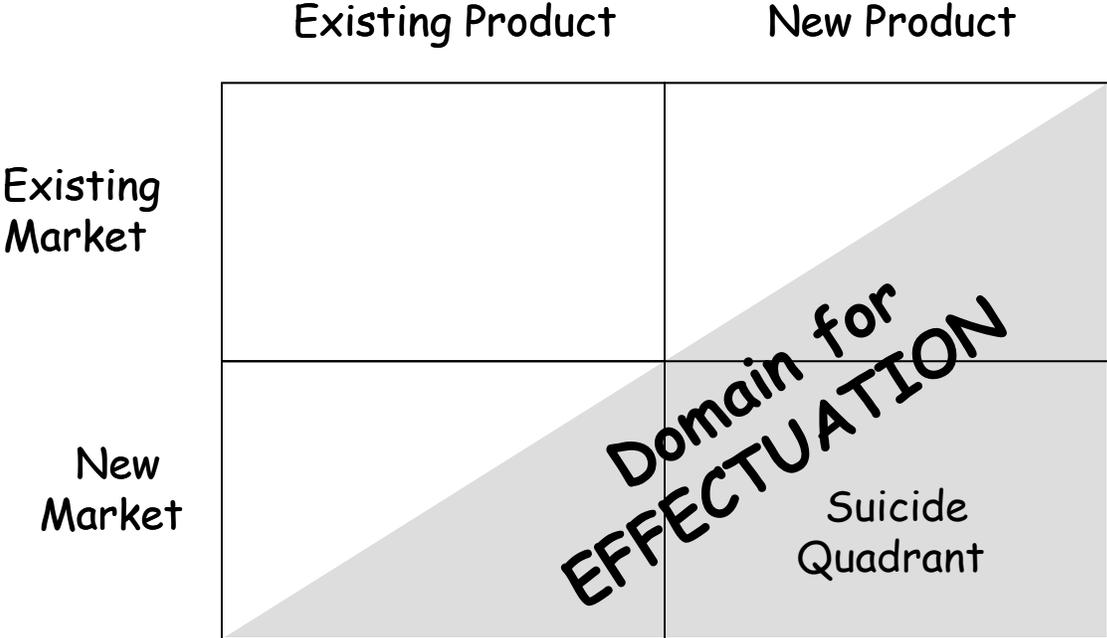
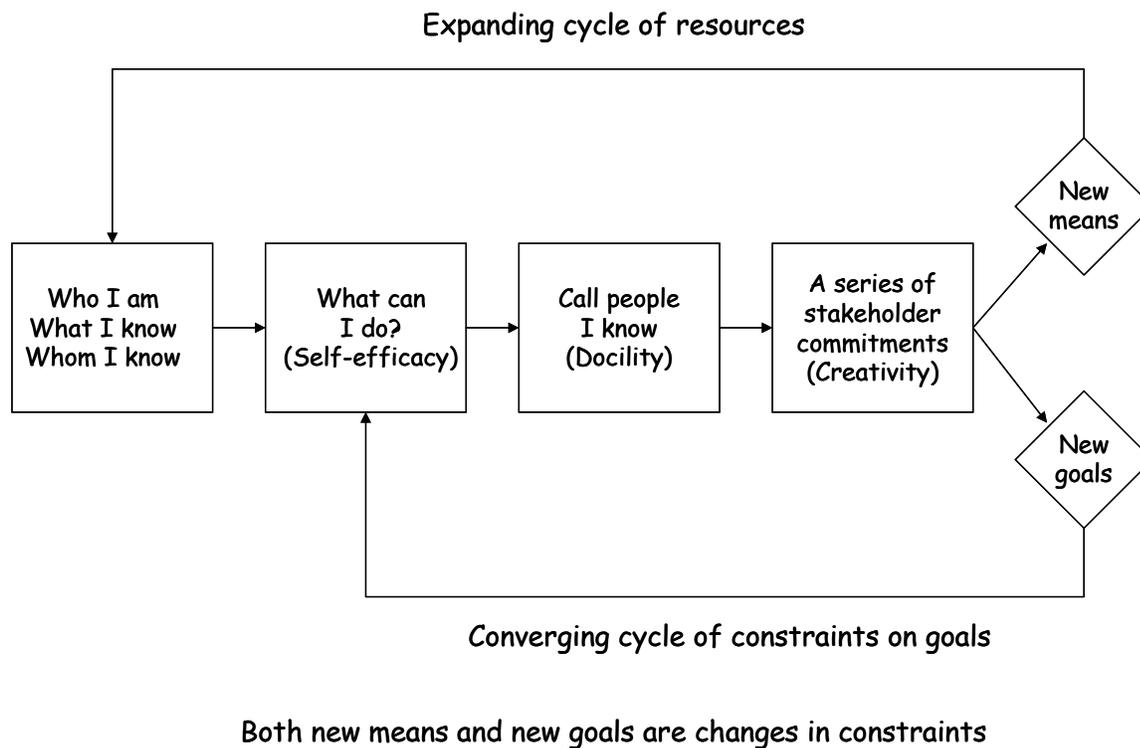


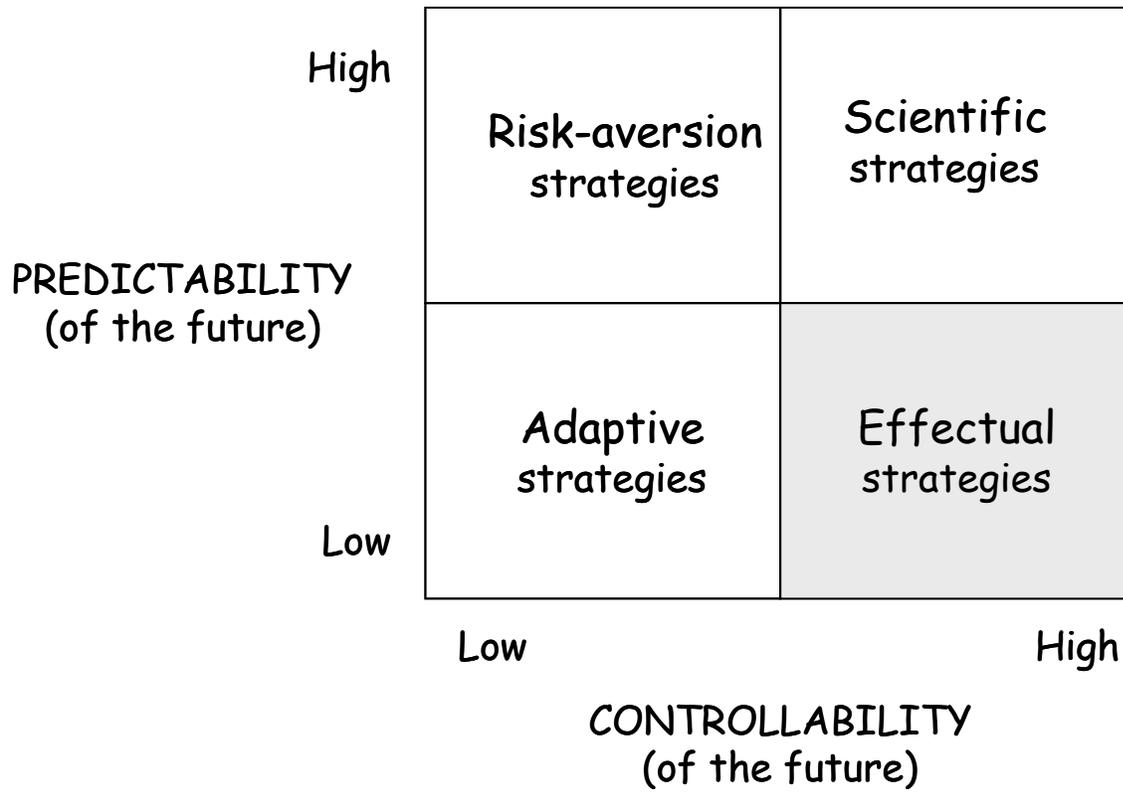
Figure 2: A dynamic model of the creation of new social artifacts through effectuation



As each stakeholder negotiates particular features of the artifact in exchange for committing resources, there are fewer and fewer areas of overlap for common goals. So the effectuation process converges into specific goals even as resources expand to implement them. This final combination of resources and goal implementations embodies the new social artifact that comes to be.

Figure 3:

Typology of problem-solving strategies with different assumptions about the future



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