



Calhoun: The NPS Institutional Archive

Faculty and Researcher Publications

Faculty and Researcher Publications

2004-06

When Markets Are Grue

Sarasvathy, Saras D.

Working Paper Series Paper No. 04-06

<http://hdl.handle.net/10945/36990>



Calhoun is a project of the Dudley Knox Library at NPS, furthering the precepts and goals of open government and government transparency. All information contained herein has been approved for release by the NPS Public Affairs Officer.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

<http://www.nps.edu/library>

Darden Graduate School of Business Administration
University of Virginia

Working Paper Series
Paper No. 04-06

When Markets Are Grue

Saras D. Sarasvathy

*University of Virginia,
Darden Graduate School of Business Administration*

Nicholas Dew

Naval Postgraduate School

This paper can be downloaded free of charge from the
Social Science Research Network at:

<http://ssrn.com/abstract=571922>

WHEN MARKETS ARE GRUE

Saras D. Sarasvathy
Darden Graduate School of Business Administration
University of Virginia
PO Box 6550
Charlottesville, VA 22906
Voice: (434) 982-2079
Email: sarasvathys@darden.edu

Nicholas Dew
Naval Postgraduate School
1 University Circle
Monterey, CA 93943
Voice: (831) 656-2441
Email: ndew@monterey.nps.navy.mil

We would like to thank the Batten Center for supporting this research. We would also like to thank the following on specific contributions to our thesis: Anil Menon for his relentless insistence on more precise formulations of effectual reasoning; Jim March for his conversation and for inspiring us to dig into Type I and Type II errors; Rob Wiltbank for firming up the section on opportunity costs; and Stuart Read for helping us clarify our writing.

WHEN MARKETS ARE GRUE

ABSTRACT

Is new market creation a *search and selection* process within the theoretical space of all possible markets? Or is it the outcome of a process of *transformation* of extant realities into new possibilities? We draw upon Goodman's (1983) Grue paradox to explain the dynamics of a new network of stakeholders. The network is initiated through an *effectual* commitment that sets in motion two concurrent cycles of *expanding* resources and *converging* constraints that result in the new market. The dynamic model was induced from two empirical investigations, a cognitive science-based investigation of entrepreneurial expertise, and a real time history of the RFID industry.

Traditionally, markets have for the most part been assumed as *givens* in economic analyses. Even strategic and marketing management have taken their cues from the exogenous markets of classical and neo-classical economics – rooted in rational choice at the micro level, and propelled at the macro level by the notion of Pareto optimality. Take for example, Arrow's (1974a) admission, "Although we are not usually explicit about it, we really postulate that when a market could be created, it would be."

But more recently, the phenomenon of *new* markets is of growing interest to a variety of scholars. A plethora of approaches and explanations vary from psychological (Carpenter and Nakamoto 1989, Earl 1998, Rosa et al 1997), sociological (White 1981, Fligstein 2002) and cultural (Douglas 1985, Wildavsky 1987) to those of evolutionary (Bianchi 1998), institutional economics (North 1990, Olson and Kahkonen 2001), strategy (Christensen 1997), and entrepreneurship (Venkataraman 1997). Very interesting and intriguing advances have also been made through theoretical explanations involving complexity (Levinthal, 1991; Axelrod and Cohen, 2000), co-evolution (Barnett and Sorenson, 2002; Murmann, 2003), dynamic capabilities (Nelson, 1991; Teece, Pisano and Shuen, 1997; Winter, 2000), emergence (Malerba et al 1999) and other ways to tackle environmental endogeneity.

We find this rich plurality both necessary and compelling in our own investigations. But we also notice that there does not seem to be a coherent philosophical basis for these disparate threads of arguments about the creation of new markets, *a la* the predominate Utilitarian basis for rational choice in the face of extant markets and given goals. This paper is an attempt to take a few early steps in thinking through a possible basis.

We define the problem of new market creation in terms of the grue paradox and the new problem of induction, first identified by Nelson Goodman (1983). This problem questions the

wisdom of looking at new market creation as a *search and selection* process within the theoretical space of all possible markets, as opposed to looking at it as the outcome of a process of *transformation* of extant realities into new possibilities. We then present a thought experiment to develop appreciative theory (Nelson, 1995) for dealing with the problem. At the heart of this appreciative theorizing is a dynamic and interactive model of a network of stakeholders that we call an “effectual network” that transforms current realities into new markets. We illustrate the effectual network by briefly tracing the origins of several new markets for the Internet. Finally, we show why it matters whether we look at new markets as artifacts in a grue world.

DEFINING THE PROBLEM IN PHILOSOPHICAL TERMS:

NELSON GOODMAN’S GRUE PARADOX

Before we define the problem of how new markets come to be, we need to define the term “market.” Like fundamental terms in any major line of inquiry – take, for example, ‘mass’ in physics, or ‘life’ in biology, markets are easier to argue about than to define. The Nobel-winning economist Ronald Coase once commented that markets – one of the two central institutions of capitalist societies (the other is firms) - had a “shadowy” existence in the economic literature (Coase 1988). Part of this shadowy existence derives from the fact that the word “market” is used in a large variety of ways (Menard 1995:168). In reviewing the literature pertaining to new markets, we concluded that the various descriptions could coalesce into three distinct categories: (1) Demand; (2) Supply; and (3) Institutions. Although it is still not easy to keep the three categories empirically separate, it may be theoretically useful to try.

1. Demand-side view. One way to define a market is as the demand for a good from “the set of actual and potential buyers of a product” (Kotler 1994:11). Buyers constitute

the market by being willing to pay for a good based on their preferences for a certain combination of attributes (Lancaster 1971) that a particular good provides that buyers have the ability to exploit. The market is referred to this way primarily by businesspeople and in the marketing and strategy literatures (Kotler 1994:12). This sense in which the word “market” is used alerts us to the way in which *individuals’ subjective preferences are seen as forming a “market”* in which various goods (with various attributes) compete for selection.

A large body of literature on the diffusion of innovations traces the development of new markets as the process by which a population of buyers adopts and exploits an innovation (Ryan and Gross 1943, Rogers 1995, Tellis and Golder 2002). The dominant “stylized” fact about the diffusion process is the S-curve: the slow growth of the market, followed by a period of rapid growth which eventually slows (Geroski 2000:603). New markets are therefore explained in one of three ways: by “epidemic” processes where the flow of information about an innovation explains market creation (Rogers 1995, Bikhchandani et al 1992); by rational economic processes where different buyers, with different characteristics and abilities adopt the innovation at different times (David 1969, Griliches 1957); and by legitimation processes, where the late “wave” of adoption is explained by institutionalization of the innovation, i.e. indicates that the market has become “taken for granted” (Tolbert and Zucker 1983).

Scholarship has taken three approaches to the ways that changes in buyer preferences potentially create new markets. The first approach is to ignore change and treat preferences as stable and outside the process of choice (Michael and Becker 1976, Adner 2002). Within this analytical framework some scholars have still creatively demonstrated how dynamic consumption effects may be modeled (Stigler and Becker 1977). The second approach is to treat preferences as liable to change but entirely exogenous to the market process (Shane 2003,

Fligstein 2002). In this approach, changes in consumer demands are treated either as an opportunity responded to by alert entrepreneurs (Kirzner 1973) or as an exogenous “shock” suppliers attempt to cope with (Fligstein 2002). The third approach takes an evolutionary view, treating demand as endogenous and co-evolving with changes in product offerings (Carpenter and Nakamoto 1989, Aversi et al 1999). In this view alert consumers take advantage of consumption opportunities offered by the market (Gualerzi 1998, Robertson and Yu 2001). For instance, Geroski (2002:28) argues that when new markets form, customers sample different product offerings and learn their preferences, which evolve from inchoate aspirations (ex: a desire for better communication) to articulated demand (ex: willingness to pay for a PBX exchange with specific features).

2. Supply side definition. On the supply side, the word “market” is defined by a product or service that firms are willing to supply. This approach is formalized in the Arrow-Debreu system (Debreu 1991) where a complete universe of all possible goods, including all contingent (state-dependent) goods, is pre-specified. In this view, what defines the “market” is what is for sale, and markets – which are formally outside the analysis – are assumed to exist, subject to certain constraints (1974b, Loasby 1999:108-109).

Three large literatures exist that take a supply-side view of markets. Industrial organization (Porter 1980, Tirole 1988) and economic sociology (Carroll 1997, White 1981, Fligstein 2002) both define markets by the group of firms competing to sell a substitutable product. White (1981) for example, states, “Markets are not defined by a set of buyers, as some of our habits of speech suggest, nor are the producers obsessed with speculations on an amorphous demand... [W]hat a firm does in a market is to watch the competition in terms of observables.” Similarly, Carroll suggests organizational ecology, “views the market as much the

consequence of organizational actions; in other words, as endogenous.” (Carroll 1997:120). In both the industrial organization and economic sociology literature streams, new markets are outcomes of industry initiatives; they come to exist when industry dynamics or an exogenous change lead suppliers to introduce a new good.

Scholars of technological change see new products as emerging from the technology commercialization process (Schumpeter 1934). The sources of technological change have been much debated in this literature (Ruttan 1997, Mokyr 1990). Early scholarship suggested demand factors were decisive, arguing that rapidly growing markets stimulate innovative activity (Schmookler 1966). Later scholarship has suggested that technologies accumulate many small improvements and therefore develop in a path dependent fashion along a “technological trajectory” (Dosi 1982) that spawns new products and markets as it evolves. Other scholars take a supply-push perspective, arguing that most new product categories result from technology change that is pushed-up by independent advances in science and technology (Rosenberg 1993, Geroski 2002), in particular by the emergence of “macro-inventions” (Mokyr 1990) some of which spawn general purpose technologies (such as the electric motor and transistor) with a large number of commercial market applications (Helpman 1998). In this view, two factors make the emergence of new markets very unpredictable: the unpredictability of the pace of improvement in technology and the unpredictable combinations, or systems, of technologies that are assembled into final products (Rosenberg 1996). Much of the literature follows Schumpeter (1942) in seeing the entrepreneur as the agent that puts new combinations of technology into consumers’ hands, in a process that pits new innovations against old, creating market “churn” (the substitution of one product market by another) and blowing “gales of creative destruction” through the economy.

3. The institutional view. Institutionalists focus on various “frictions” (MacMillan 2002:9) in the process of making exchanges. These frictions make transacting costly and, since the costs of transacting must be taken into account in any market exchange, transaction costs reduce the amount of exchange and therefore limit the extent of markets. A paper by Economides and Siow (1988:108) illustrates this point nicely by pointing to the fact that in the Arrow-Debreu model “with no friction there are as many markets as there are commodities”. However, once certain frictions are introduced, the number of markets is reduced. One illustrative friction is the cost of making your way to a market (transportation costs). Because traders prefer more liquid markets to less liquid ones, they trade off travel costs with the benefits of trading in more liquid markets; therefore markets without enough traders are extinguished (Economides and Siow 1988). Other sources of friction include the costs of search, bargaining costs, and the costs of measuring and enforcing property rights (Coase 1988, North 1990, Williamson 1985). Institutionalists see a market as, “a specific institutional arrangement consisting of rules and conventions that make possible a large number of voluntary transfers of property rights on a regular basis.” (Menard 1995:170). Markets therefore make exchange cheaper than it would be without markets. Sociologists add that market transactions are embedded in broader social institutions that create trust, and that reduces the cost of exchange (Granovetter 1985, Uzzi 1997).

For institutionalists new markets are created by inventing ways to reduce friction – eBay, for example, is a market-maker (Casson 1982, Spulber 1997) that utilizes the internet to reduce the friction created by search costs, thus enabling new markets for a variety of products that could not easily be traded before the invention of the internet. At the macro-level many scholars (Arrow 1962, Kahkonen & Olson 2000, North 1990) see an important role for “market-

augmenting” governments in creating and enforcing the “rules of the game” in capitalist systems, in particular the system of property rights that are essential for markets to come into existence, as well as the wider body of regulations that enable markets.

Current views of opportunities for the creation of new markets: Is the grass green? Or blue (i.e some color other than green)?

In sum, when we talk about the market for an established product like Coke, we include all three meanings of “market” specified above. First, there are people who want to drink Coke and are willing and able to pay for it; second, there are people who are willing and able to make Coke for the price that customers will pay for it; and third, there exist a variety of institutions such as distribution mechanisms and FDA approval that allow/enable Coke to get safely from the producer’s hands into the consumer’s body. The market for Coke is as easy to recognize as the fact that grass is green. This is true of any well-established extant market.

The problem of new markets, however, is not so simple. Even the Coca Cola company found that out the hard way when it tried to introduce New Coke to replace the old formula. As a variety of scholars have pointed out, the creation of new markets is fraught with incomplete information – and that is putting it mildly. Even if we take demand as exogenous and relatively stable, there appears to be an infinite number of ways in which extant demand could be met through technological progress and the spread of free market institutions. And if we throw in endogenously changing preferences into the midst, the problem quickly becomes intractable.

Yet, entrepreneurs and managers have to deal with the problem of the creation of new markets. Furthermore, they often have to deal with the creation of new markets concurrently with the necessity to survive in extant markets. March (1991) captured the tradeoff inherent in

this problem as the relationship between exploration of new possibilities and exploitation of old certainties as follows:

Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution.

The essence of exploitation is the refinement and extension of existing competences, technologies, and paradigms. Its returns are positive, proximate, and predictable. The essence of exploration is experimentation with new alternatives. Its returns are uncertain, distant, and often negative.

A large number of empirical studies of the creation of new markets attest to the uncertainty, time lags and failures involved in the exploration of opportunities for new market creation. The literature on diffusion alone includes almost 4,000 studies (Rogers 1995), and attests to the fact that most new markets are unpredictable *ex ante*, and take a long time to come to be, if they ever do come to be (Gort and Klepper 1982).

So, if we ask the question, “How can an entrepreneur starting a new venture, or a manager in a large corporation, act on the problem of new market creation?” the predominant answer today consists of some form of exploration of the universe of possible markets. In other words, if the grass is not green, it has to be some color other than green – blue, for example – the other color being drawn from the spectrum of all possible colors. Even though the spectrum may consist of an infinity of possible colors, and boundedly rational creatures may explore only a small portion of the spectrum at any given point in time, it is indeed possible to create new markets through a process of exploration – i.e., through *search, variation, risk taking, experimentation, play, flexibility, discovery, innovation*, and so on.

In “The Birth of a New Market,” for example, Bala and Goyal (1994) postulate that new markets are constantly “opening up” because of technological, political or regulatory changes, saying that the emergence of the new market then depends on the expectations of entrepreneurs

and their requisite attempts to enter the market. In fact the rhetoric of “entry” pervades a substantial portion of the growing literature on new market creation (Ex: Geroski 2002). Miller and Folta (2002) take a similar view in “Option value and entry timing” where they describe a firm’s decision to enter a new product or geographic market in terms of purchasing an option on being involved in the market.

In the final analysis, either new markets exist in some theoretical sense and firms *enter* these new markets through a variety of exploratory strategies, or new markets *emerge* as a result of technological and institutional evolution of populations of firms engaged in adaptive processes of exploration and exploitation within a changing competitive landscape. It is this “big picture” philosophy of a pre-existent universe of all possible markets as the micro-foundation for action that we wish to re-examine in this paper.

In particular, we wish to postulate a new micro-foundation based on the reformulation suggested by Goodman (1978): *We have come to think of the actual as one among many possible worlds. We need to repaint that picture. All possible worlds lie within the actual one.*

Goodman’s question: How do we know the grass is green or blue, and not grue?

In his provocative book *Fact, Fiction, and Forecast*, Nelson Goodman introduced what he termed “the new problem of induction,” a mind-bending twist on David Hume’s original problem of induction. Here is a restatement of the problem:

Take the inductive conclusion, “All emeralds are green.” This induction is derived from the fact that all instances discovered so far have been green. From this we can make the inductive projection that emeralds discovered in the future will also be green. In other words, all emeralds, past, present, and future, are, in fact, green. At this point, Goodman introduces the disjunctive predicate “grue,” which applies to all those things that are green before time t , and

blue after time t . We can set t at any arbitrary point, so long as it is in the future – say, June 1, 2080. Inductively we have to conclude now that all emeralds that we have observed till date are not only green, but are also grue. In other words, there is as much evidence for accepting the hypothesis, “All emeralds are green,” as there is to accept the hypothesis, “All emeralds are grue.” We have no way of refuting this “fact.” But by confirming the fact that emeralds are green *and* grue, we are also confirming the fact that they will be blue (or any other color we choose for that matter) in the future. As Abrams (2002) puts it:

... using what seems to be a standard inductive pattern on a property, i.e., being grue, seems to give us reason to believe that each emerald, somehow, will actually turn blue.

The grue paradox, or Goodman’s new problem of induction has been re-stated and studied in a variety of domains other than philosophy. Take for example, Akeroyd’s (1991) *A Practical Example of Grue*, where he applies it to the economic relationship between the percentage rate of unemployment and the percentage change of money wage rates known as the simple Phillips curve. For the purposes of this paper, we do not want to jump into the deep waters of philosophical arguments as to what grue means in some universal sense – we leave that to the extraordinary number of able philosophers who are already at the job. Instead, we begin, as many good philosophers do, with a rather simple, but illustrative example of the problem that is relevant to the phenomenon *we* are interested in examining, namely the creation of new markets – for example, in the case of the commercialization of the internet (Reid, 1997).

Let us take a quick look at the chronology. By 1985, the Internet was already well established as a technology supporting a broad community of researchers and developers (Leiner et al. 2002). But it was not until 1993 that NCSA released the first alpha version of Marc Andreessen's "Mosaic for X," and 1994, when he and his colleagues left NCSA to start "Mosaic Communications Corp" (later Netscape). Amazon.com launched its website in July 1995.

Netscape went public in August 1995, initiating the Internet Bubble on the stock market. At the time, Nasdaq was still referred to as an OTC (over the counter) market, not the “virtual trading floor” we talk about today. And finally, on October 24, 1995, the FNC (Federal Networking Council) unanimously passed a resolution defining the term *Internet*.

In terms of Goodman’s predicates, we could call the Internet before January 1, 1994 (i.e. before the launch of Netscape), *r*Internet to signify the fact that the Internet was mostly used by researchers and academics at that time. And the Internet after 1/1/1994 could be called *c*Internet to signify the fact of the Internet becoming really hot commercial property.

First, from the supply side. How would a founder/developer of *r*Internet discover the commercial potential for *c*Internet? Second, from the demand side. How would a manager at Barnes and Noble discover the potential for *d*Internet (retail distribution through the Internet)? Third, from the standpoint of institutions. How would organizations such as the FNC converge on a definition of the *r*Internet/*c*Internet or *x*Internet? Or an over-the-counter market such as Nasdaq come to be known as a virtual trading floor on the *t*Internet?

It seems almost immediately obvious, given our understanding of markets today, that the various actors involved needed to *explore* *x*Internet to discover *d*Internet, *t*Internet, and so on, and the developers of *r*Internet must stand ready to *exploit* the new markets for *c*Internet, when it gets discovered. And as the chronology shows, March’s insight that the returns to exploration are *uncertain, distant, and often negative*, forms a pretty good explanation of why it took so long for people to discover *c*Internet. As we know, underlying the worldview of exploration is the philosophy that there pre-exists a universe of all possible markets that compete for the winning candidacy – a space of *x*Internet, as it were – and this space may be so vast and/or so sparsely

populated with good solutions as to require enormous amounts of search and experimentation, not to mention dead-ends along the way.

But there is another explanation for why Barnes and Noble did not launch the first *d*Internet bookstore; or why Nasdaq could not envisage that *t*Internet was the way to go. And that explanation has to do with the fact that new market creation is an *isotropic* process. Isotropy refers to the notion that it is not at all clear *a priori*, which pieces of information are relevant to the search for a solution (Fodor, 1987). In Goodman's terms, a phenomenon that looks *ex post* like an exploration of *x*Internet markets, or the exploitation of *r*Internet for commercial purposes, is in actual fact *g*Internet (*grue* Internet) *ex ante*. In other words, the Internet is *grue* to begin with and no amount of information can actually specify all possible *x*Internet markets before those alternate markets actually come to be. We no more have a way of refuting the fact that *r*Internet is *grue* than we have of refuting Goodman's fact that all emeralds are *grue*. Furthermore, even as *r*Internet gets transformed into *c*Internet, the Internet continues to remain *g*Internet.

The interesting question for us then becomes, how does one act under the assumption that new market creation is an isotropic process, as opposed to the assumption that any actual market is one of many possible markets that in theory could be specified *ex ante* if only all information were available *a priori*? And what difference does it make whether we suppose markets are green/blue, or that markets are *grue*?

WHEN MARKETS ARE GRUE: A THOUGHT EXPERIMENT

To clarify key elements of our theoretical development, we use a thought experiment (Folger, 1999). The thought experiment is encapsulated in a dynamic model of how entrepreneurial action transforms extant reality into new markets through a chain of stakeholder

commitments over time. We call the resultant network of stakeholders an effectual network. First, we will briefly outline the dynamic model as it is laid out in Figure 1, and then describe in detail the commitment at the heart of the model through a thought experiment. We will then generalize the thought experiment and describe how a chain of commitments forms the effectual network that transforms extant realities into new markets.

Dynamic model of an effectual network and new markets

The dynamic model, graphically represented in Figure 1, has been induced from two empirical studies, Sarasvathy (1998) and Dew (2003). The former consisted of a verbal protocol analysis of expert entrepreneurial decision making, and the latter chronicled the history of the RFID (Radio Frequency Identity) industry.

INSERT FIGURE 1 HERE

Currently major threads of research in entrepreneurship are based on the green/blue paradigm of exploring the universe of all possible markets (however locally or globally) and then exploiting those that are most predictable, and/or score high in terms of expected return calculated *a priori* or some formal or informal version of real options logic. We call this a *causal* process that begins with exploration resulting in the identification, recognition or discovery of an opportunity, followed by a series of tasks to exploit the opportunity. The standard set of causal tasks includes (a) developing a business plan based on (b) extensive market research and (c) detailed competitive analyses, followed by (d) the acquisition of resources and stakeholders for implementing the plan, and then (e) adapting to the environment as it changes over time with a view to (f) creating and sustaining a competitive advantage. In this view, if an entrepreneur wanted to start a restaurant, he or she would start by identifying a high potential location, analyzing the competition in the area, identifying particular target

segments, developing menus, décor, and marketing strategies to fit the targets, obtaining necessary funding, hiring the appropriate chef to develop the right menu and then opening the doors to the restaurant.

As Figure 1 shows, effectuators, in contrast, may or may not start with an “opportunity.” Instead they start with who they are, what they know, and whom they know, and begin acting upon whatever they can afford to do. Most important of what they *can* do is to call people they know or meet, and plunge straight into negotiating a series of commitments. We will examine these initial commitments in great detail in the thought experiment below. For now, it is important to note that the opportunity (real or perceived or otherwise) does not determine who comes on board. Instead, those who come on board, and what they commit to the enterprise, together with other contingencies that occur along the way, determine what opportunity gets created.

The ensuing chain of commitments sets in motion two contrasting cycles. The first cycle increases the resources available to the venture by increasing stakeholder membership in the effectual network; and the second accretes constraints on the venture that converge into specific goals that get embodied in an effectual artifact over time. In the restaurant example above, the effectual entrepreneur may or may not start with a location. Instead it would all depend on who the effectuator is. If the effectuator is a cook, he might start a catering service, or a lunch service, or even just hire himself out as a chef who does house-calls – it depends on what he can afford to invest in terms of money, time, and emotion. An expert effectuator would not even jump into one of these projects. She would start by calling people she knows and start putting together partnerships and commitments. For example, if she knew someone who owned a grocery store, she might partner with them and start making dishes for their deli. Or if she

knows someone in the popular media, she might get involved with them to start a production company that makes cooking videos. And so on.

In the causal (green/blue) world, the end product is determined by the initial “opportunity” identified by the entrepreneur through exploration, and the adaptive changes over time to exploit the pre-selected “market” and/or “vision” that is initially “envisaged” as existing in the theoretical space of all possible markets. Success or failure of the venture would depend on how accurate its predicted vision turns out to be and how well it executes strategies based on that vision. The process in the effectual (grue) world is fundamentally different. The end-product of this process is inherently unpredictable at the beginning of the process because the process is actor-centric: it depends on which actors come on board with what commitments. In fact, the opportunity gets produced through a process that continually transforms existing realities into possible markets. In our ensuing analysis of the effectual commitments at the heart of the process outlined in Figure 1, we will concurrently trace the *expanding network* and the *converging artifact* or new market.

The initial commitments

To understand how the first effectual commitment initiates the network of stakeholders that transforms extant reality into new markets, we turn to a thought experiment. Although we believe that this thought experiment can be generalized to a variety of situations under which new markets come to be, for the sake of precision and clarity, we will restrict ourselves to the creation of a new market for a new product, say widget *X*. [Note: Widget *X* need not be technological. It can be something in nature such as a lemon, or it could be a service, a work of art, a minor irritation, a major problem, or an actionable idea].

Let us assume Entrepreneur *E* brings widget *X* to Customer *C* to make a sale. [Later in the analysis, we will show that *C* can be any kind of a potential stakeholder, such as an investor, a supplier, a

strategic partner, etc.] Also, for the moment, it does not matter whether we assume that *E* is proceeding causally (i.e. has found *C* through predictive approaches such as market research) or effectually (i.e. has found *C* through non-predictive mechanisms such as through her existing social network or some kind of a garbage can).

Let us further assume that she wants to sell 1,000 units of *X* to *C* at \$100 a piece. Let us now imagine that *C* says the following:

“I will gladly buy *X* if only it were blue instead of green.” (Of course, the very first *C* may or may not say this, but we assume *E* keeps talking to people she knows or meets until she finds the first *C* who is interested)

Now *E* has a decision to make. Should she go ahead and invest in making the widget blue (cost \$10 K, say)? There are several criteria she may consider in making this decision. First, she may or may not have the \$10 K needed to make the modification. Second, if she does make the modification, *C* may or may not buy. Third, there may or may not be other possible customers (say, *D*) who may be willing to pay >\$100 (say, \$120) per unit for a green *X* – i.e. for the widget as is, without any modification.

Assuming that *E* has the money to make the modification, *E* needs a mechanism that will decide whether *C* is indeed a customer (T = True) or is actually a non-customer (F = False) who will not buy the modified blue *X*. This mechanism, like any other mechanism we can devise will of course be prone to two types of errors. It may either classify *C* as a non-customer (F) when *C* is in fact a customer (T) [Type I error]; or, it might classify *C* as (T) when *C* is actually not a customer (F) [Type II error]. Again, assuming *E* has the money to make the modification, there are 3 possible solutions to this problem:

Solution 1: Using the exploration paradigm, *E* goes in search of other possible customers *D* first. If no *D* exists, then *E* gets *C* to sign a contract that penalizes *C* if he decides not to buy the modified widget. [Note: This is psychologically highly unlikely unless *E* and *C* have an ongoing relationship of trust. In the case of an emerging new network, *C* faces two types of uncertainties leading to contractual hazards here. (a) *E* may not be able to deliver the modified widget as per contracted specifications (unknown competence); or (b) it might not be possible to specify very clearly in advance what exactly *C* wants modified and *C* could find himself in trouble by signing an incomplete contract].

Solution 2: *E* invests (or goes out and raises) \$10 K in expectation of the net profit due to the order from *C*. Without an enforceable contract, this expectation is unreliable at best as a decision criterion. But *E* could also do this effectually, using the affordable loss principle – i.e. not with the expectation of any net profit from a potential transaction with *C*, but merely as an investment that she could afford to undertake (and lose) with imagined possibilities of other uses for the blue widget in case *C* chooses not to buy. In this weakly effectual case too, this investment is not a reliable one for market creation except in its potential for exaptation (Dew et al, 2004).

Solution 3: The final solution to the problem is the strongly effectual one consisting of any mechanism that reduces Type I errors at the cost of incurring Type II errors. In other words, the effectual commitment *always* favors the error of letting possible customers go as opposed to letting non-customers drive the decision process. In our current thought experiment, the strongly effectual solution takes the form of the following counter-offer to *C*:

“It will cost me \$10 K to make the modification you suggest. I will make the modification if you will put up the \$10 K up front. In fact, if you will pay for the modification, I will even supply you the modified widget at \$80 per unit, so ultimately you will end up saving money on this purchase.”

[Note that this solution does not require *E* to search for all possible *D*'s before making the counter-offer. And this explicit ignoring of opportunity costs is what makes it different from exploration. We will examine the logic for this in a separate section below]

Let's now examine *C*'s decision as to whether he wants to commit \$10 K for transforming green *X* into blue. Again, (1) *C* may or may not have the \$10 K; (2) *E* may or may not deliver the modified widget; and, (3) *C* may be able to find someone else to make the blue *X* for < \$80 a piece. Assuming that *C* has the money, while in the causal case it is obvious that he will invest it with *E* only of there is no one who can supply blue *X* at < \$80, effectuation suggests he make a counter-offer to *E* as follows:

“I will invest \$10 K to transform your green widget into blue X. But, instead of a discount on the price, I would like to take equity in the product and share future returns on it.”

The two effectual counter-offers together transform the relationship into a partnership that commits both to a blue widget world. Furthermore, under this partnership, both *C* and *E* need to specify blue *X* only to the extent possible at this time, leaving it up for re-negotiation as they together develop the product. *E*'s contractual commitment to undertake the modification signals her private estimation of her own competence, and *C*'s investment of \$10 K identifies him as an actual customer (T).

In this thought experiment we have assumed that *C* knows he is indeed a customer and *E* knows herself to be a supplier. But the effectual commitment would work even if we reversed this assumption – i.e. if we assumed that *C* and *E* have high levels of goal ambiguity, with *C* not quite sure that he actually wanted *X* and *E* not quite sure that she wanted to make *X* (green or blue or otherwise), as if neither knew whether there was a market or even a latent market for *X*. By meeting each other and coming up with terms that were *doable* within the constraints of their current lives, and then actually committing themselves to those terms, they set in motion a chain of commitments. [Note: There is no guarantee that this will indeed happen. All we wish to show here is how it *could* happen]. We will now trace the consequences of such commitments actually occurring in the world.

The first consequence is that when two stakeholders make a commitment, they are *de facto* behaving as though the market is *grue* – i.e. they are transforming green *X* into some *X* other than green, including *X*'s no one could have imagined before the actual transformation, and NOT selecting between a green *X* and a blue *X*. In our thought experiment, this transformation process happens as follows: By walking into *C*'s office and making the counter-offer based on the effectual commitment, *E* became a supplier *de facto*. And by actually investing in *E*, *C* became a customer *de facto*. Each did not have to be 100% certain about their own potential as the two sides of this commitment until the actual moment of commitment.

Their mutual commitments forge an initial network of stakeholders that eventually transforms extant reality into a new market. To the extent that widget *X* is unformed and

negotiable, this market is not a phenomenon of discovery but of transformation leading to the creation of something new, which makes the market for *X* an *outcome* of the interaction between *C* and *E*. Initially, neither party knows what this *X* may or may not be worth down the road, or even whether it will be green or blue or something neither imagines at this moment. The entire process is driven by interaction – the stakeholders prospectively negotiate the very existence and shape of *X*. The content of the negotiation is not much concerned with the opportunistic potential embodied in the green vs. blue widget (for neither party knows what this *X* may or may not be worth down the road or even whether it will be green or blue or something neither imagines at this moment). Instead the content of the negotiation is about what each would like *X* to look like and what each is willing to “commit” to *make* it look like what s/he wants it to be. Thus, the set of commitments that define an effectual network consist in agreements to participate in the transformation of an existing widget, rather than in agreements to appropriate future payoffs arising out of calculated/predicted evaluations of a new invention.

In other words, *C* and *E* are negotiating for what *X* “will” be – not in a predictive sense (although prediction may or may not be part of the reasons for negotiating between green and blue *ex ante*), and not in a social construction sense (although the world may or may not actually come to consist of blue widgets *ex post*), but merely in the sense that both actually invest in a blue widget world and actually begin making blue widgets. Even more importantly, their negotiations proceed as though *X* is *grue* – i.e. that *X* is transformable from green to colors other than green; not that *X* is a choice among one of any *given* set of colors. The actual color, therefore, may or may not be something either had imagined till their interaction at the negotiating table. There is always room for the actual transformation to surprise them with a color neither knew existed. ***The point of disjunction for the predicate ‘grue’ in the context of***

new markets is not some arbitrary point t in the future, but the act of commitment by two stakeholders to a particular future X .

Generalizing the thought experiment

At this point we can take the discussion back to Figure 1 and see how the atomic interaction within each effectual commitment results in the two cycles that increase the size of the network and the resources available to it at the same time constraining the possible goals of the stakeholders to converge into a new market. Also, we can now generalize the thought experiment into a wide variety of new market contexts and iterate it over time. For example, C and E can be angel and entrepreneur, instead of supplier and customer. Or, they can be two random entities (individuals or organizations) with problem components and/or solution components that match, resulting in a strategic partnership that then leads to the creation of a new market based on the combined solution they forge. And so on. In general, X can be any component of a market including demand side elements such as needs and wants, supply side components such as technology, product and/or service, as well as institutional structures of a market such as channel, regulatory infrastructure, standards bodies, and so on.

In this general conceptualization of X , each new membership in the effectual network negotiates a tiny piece of the future market – a pleasing or meaningful juxtaposition of two or more fabric patches, as it were – and the market that comes to be eventually is like a quilt stitched together through the effectual network as it grows and gradually transforms extant realities into the familiar artifact of the market. In essence, then, each new member in the network not only brings certain resources to the venture, including who they are, what they know, and whom they know, but also a set of constraints on what transformations can be carried out on X . In other words, each additional hand that seeks to shape the artifact firms up parts of

the clay, as it were, necessitating fewer and fewer transformations that are meaningful and useful in the future. It is this shared accretion of constraints that eventually gets embodied in the demand and supply schedules, as well as the institutional structures of the new market.

The effectual nature of the commitment process allows the members of the network to proceed as though the universe at any given point in time consists entirely of only the people who are at the table – as though the external world is relevant only to the extent it is embodied in the aspirations and abilities of the people at the table. In other words, the particulars of who they are, what they know, and whom they know matter and drive the creation of the pie or the final artifact the network ends up cooking up. It is only when the dish is done and the aroma begins to waft out of the room that both the issue of opportunism (who gets what piece of the pie) and opportunity costs (what other pies may be “out there”) become more relevant. We will examine that transition next, as a dialectic between the members of the network and the external world. [Note: In the interests of uncluttered exposition, we will examine the two issues of opportunism and opportunity costs in more detail later in the paper]

The market as artifact, or How the effectual network grows into a new market

As the effectual network grows over time, and includes more and more of the external world, it tends to become less effectual as it eventually coalesces into an empirically distinct new market. In this section, we envisage this transition as a dialectic between members already on board and the external world.

In his seminal work, *Sciences of the artificial*, Simon (1988) described the artifact as lying on the thin interface between the inner environment and outer environment. As all things artificial, the market created by an effectual network too eventually becomes a dialectic between inner and outer environments where each comes to resemble the other in important ways – just as

shovels are designed to take the shape of the earth they need to scoop up at one end and the hands that hold them at the other (Simon, 1988).

The new market, however, gets fabricated, not through the designs of any one person, but as a chain of interactive commitments that form the interface between the inner environment of the effectual network (current members of the network), and the outer environment (current non-members). At any given point in time, the effectual network is impacted by one of three categories of things: (1) interactions that become embodied in actual additional commitments; (2) those that do not; and (3) non-negotiable exogenous states of nature. The resultant artifact, i.e., the new market that comes to be, is an *outcome* of how the network deals with each of these three categories

Category 1: Interactions that become embodied in actual commitments. We have examined this category in great detail in our thought experiment. In sum, interactions that become embodied in actual commitments determine new membership in the effectual network, as well as the initial shape of the artifact and its transformations into particular market structures. And as we saw earlier, the effectual network proceeds for the most part by ignoring the external world, except in as much as the external world is embodied in the actual members of the network. As the network adds members, however, there is less room for transformational negotiations with newcomers. Eventually, the network reaches a point where, new members have to take most of *X* as they find it, or forgo membership in the network. At around this point, interactions that do not become embodied in actual commitments carry vital information to the survival of the new market.

Category 2: Interactions that do not become embodied in actual commitments. Each negotiation that does not result in a commitment signals one of two possibilities: (1) It

suggests significant transformations yet to be negotiated to fabricate the new market, or (2) It points to existing alternate markets or other effectual networks that may eventually coalesce into alternate markets that compete with and dissolve the nascent market being formed by the effectual network under consideration. In other words, while each actual commitment transforms current reality into features of a new artifact, rejected commitments point to bounds for the transformation and signal finite alternatives to be explored.

With regard to interactions that do not result in actual commitments, members of the effectual network can respond in one of three ways:

- They can ignore them and continue to build the network effectually;
- Begin exploring some alternatives to growing the network effectually; or,
- Declare the effectual transformation complete and begin competing with alternative markets.

In any case, there comes a point of time in the transformation process, when the effectual network has coalesced into a market – i.e. when the continual effectual churn at its outermost edges tapers off and barriers get shored up around its key components. Once the chain of commitments has converged into a distinct new market, at least for a reasonable length of time, the effectuators need to craft and implement strategies based upon the exploration-exploitation paradigm. This transition can either occur naturally as the effectual network converges to a new market, or can be actively determined by members of the network in light of competitive networks in the making. How this transition point actually occurs in the creation of particular markets is a matter for future empirical investigations.

We have some hints about how entrepreneurs transform their decision making from one primarily based on a grue world to one where exploration/exploitation becomes more useful. In the effectual or grue phase of the fabrication of the artifact, entrepreneurial actors continually

make up stories and visions of the artifact even as they garner commitments from incoming stakeholders who seek to shape and reshape these stories and visions. But the point when the artifact becomes a thing on its own is often heralded by a metaphor that comes alive or a clear vision that captivates the imagination of all concerned. This “Vision” then becomes the compelling vehicle of communication that accelerates the entire process and really solidifies the remaining structures of the new market. Take for example the term, “information superhighway” coined by Al Gore in 1994 in the case of the cInternet.

Category 3: Events completely exogenous to the process. This brings us to the final piece of the dialectic between effectual network and outer environment, namely the part that is completely exogenous to the process. This could consist in exogenous shocks (positive or negative) such as those in the macroeconomic/regulatory environment or in the technology regime, as well as some kind of internal contingency such as the exit of a key member of the network. In case of such contingencies, complete and cascading failure of the effectual network may not be avoidable, just as explosive growth of the new market may become possible. In any case, such contingencies will call for a certain amount of responsive re-shaping of the artifact in question. To the extent that the collective imagination of the network internalizes and leverages these contingencies as input into the shape of *X* the network will continue to grow and coalesce into the stable artifact of a new market.

To summarize

We began our development of a new philosophical basis for the creation of new markets by positing a dynamic model of stakeholder interaction. This dynamic model, graphically represented in Figure 1, illustrates how an entrepreneurial actor begins with who he is, what he knows, and whom he knows, and sets in motion a network of stakeholders, each of whom makes

commitments that on the one hand increase the resources available to the network, but on the other, adds constraints to future sub-goals and goals that get embodied into particular features of the artifact. Over a period of time, assuming the network keeps growing and is not dissolved due to exogenous shocks or fatal conflicts within its ranks, the pool of constraints converges into the new market. At the heart of this dynamic model is the atomic notion of an effectual commitment. The effectual commitment has several characteristics:

1. It focuses on what is controllable about the future and about the external environment, irrespective of their predictability; it also explicitly eschews predictive information that cannot be encapsulated into controllable events.
2. Each effectuator commits only what s/he can afford to lose, and not what may be calculated as necessary to achieve predetermined target returns or outcomes.
3. Who makes actual commitments and what they negotiate in terms of features of the artifact determines the goals of the network; pre-existent goals do not determine who is induced to come on board.
4. As means available to the network increase, goals achievable become more and more constrained. In other words, *what* the artifact can look like becomes solidified over time even as many more ways of *how* to make it look like what the stakeholders want it to be become possible.
5. The key to the process here is not *selection* between alternatives (be they alternative ends or means), but *transformation* of existing realities into new alternatives through a growing chain of effectual commitments. Harking back to Goodman's vision: *We have come to think of the actual as one among many possible worlds. We need to repaint that picture. All possible worlds lie within the actual one.*

When markets are grue: Transforming *r*Internet into *c*Internet

We emphasized earlier that the point of disjunction for the predicate 'grue' in the context of new markets is not some arbitrary point *t* in the future, but the act of commitment by two stakeholders to a particular future *X*. And then we showed how that initial commitment sets in motion an effectual network that grows even as it transforms extant realities into a new market. Such a commitment in the history of the Internet can be located in the partnership between Jim Clark (founder of Silicon Graphics) and Marc Andreessen, who wrote *Mosaic*, the first web browser. That commitment launched "Mosaic Communications Corp" that later became Netscape. Three different descriptions of how the commitment came to be are provided in

Appendix 1. The descriptions are taken verbatim from (1) a historical account by Reid; (2) an anecdotal report on a Stanford University website; and (3) a newspaper article published in USA today. Taken together, the narratives suggest the following facts about the commitment:

1. Both Clark and Andreessen were doing their own thing, and did not envision commercializing the Internet. Clark knew virtually nothing about the Internet, and Andreessen knew nothing about business.
2. Foss, who came upon Mosaic, and showed it to Clark, did not know Andreessen.
3. Neither Clark nor Andreessen searched for other possible partners before committing to the project – i.e., they did not take into account of any *D*, before committing to *C*.
4. Clark and Andreessen were not part of the same social network. Even after Clark and Andreessen met, they did not quite trust each other and had to work at building a relationship.

We earlier illustrated how an effectual commitment embodies the point of disjunction in the grue nature of new markets as opposed to an arbitrary point of time *t* in Goodman's formulation. Now we turn to understanding the role of opportunism and opportunity costs in this crucial moment of transformation in grue markets.

OPPORTUNISM AND OPPORTUNITY COSTS IN A GRUE WORLD

At the beginning of our analysis of the effectual commitment, we asked two questions. First, how can an entrepreneur/manager act in a grue world, as opposed to a green/blue world? And what difference does it make whether s/he acts as though she is selecting from one of many possible markets or as though she is transforming existing realities into new markets? We have analyzed the first question in great detail and illustrated that the key difference lies in *ignoring opportunity costs* – i.e. NOT exploring beyond the first effectual commitment; and then letting the growing network of stakeholder commitments determine what the new artifact will be.

We can postulate that each commitment consists of two parts that go hand in hand in both world views: (i) the commitment to *X*, the artifact; and, (ii) the commitment to *C*, the network. The pivotal difference between the grue weltanschauung, as opposed to that of green/blue is that in the grue world, the commitment to *C* trumps the commitment to *X*. In other words, in the

green/blue world, the entrepreneur/manager commits to a vision of the new market, and that vision then drives their strategies as to which stakeholders they seek to bring on board. Both X and C in the green/blue world are chosen through processes of exploration – i.e. searching the space of possible alternatives (under standard assumptions of bounded rationality). The problem, in this case, has to do with when and how the search is brought to a halt. Presumably, the answer to that problem depends on the stated goals of the enterprise. Criteria for evaluation of alternatives are developed based on performance goals, and selection may be based either upon standard NPV calculations or some form of real options logic.

In the grue world, the commitment to X , of course, is always tentative, always subject to change through the terms negotiated by new stakeholders coming on board the network. Perhaps the grue artifact X is more usefully conceptualized as a series of transformations x_i , rather than the notion of any one X . The commitment to C , however, is substantial and very real, as C will have a real voice in future stakeholder interactions. Furthermore, the commitment to C not only involves actual commitments to particular transformations of X , but also involves an explicit pre-commitment *not* to explore alternatives D before making the commitment. It is this binding constraint of limiting oneself to the bird in hand with regard to stakeholders that clearly distinguishes action in the grue world from decision making in the green/blue world. Now the question for the grue world at the point of commitment to any particular stakeholder becomes, “Why are opportunity costs with regard to other possible stakeholders ignored?”

A textbook definition of opportunity cost would calculate the cost of an action A as the value of the alternative opportunity O given up in choosing A over O (Jensen, 1982: 48).

Buchanan¹, however, whose *Cost and Choice* is acknowledged as the canonical analysis of opportunity costs, is a bit more subtle and elegant in the opening paragraph of his preface (1969):

You face a choice. You must now decide whether to read this Preface, to read something else, to think silent thoughts, or perhaps to write a bit for yourself. The value that you place on the most attractive of these several alternatives is the cost that you must pay if you choose to read this Preface now. This value is and must remain wholly speculative; it represents what you now think the other opportunity might offer. Once you have chosen to read this Preface, any chance of realizing the alternative and, hence, measuring its value, has vanished forever. Only at the moment or instant of choice is cost able to modify behavior.

Yet, we have argued above that the effectual entrepreneur/manager explicitly ignores the value of *D* and brings *C* on board purely based on the fact that *C* makes an actual commitment to modify *X* – i.e. fabricate a piece of the new market. Since each effectual commitment involves both a commitment to a transformation of the artifact *X*, as well as a commitment to a specific stakeholder *C*, we will look at each in turn next.

Committing to *X*: The problem of means and ends

By keeping motivations completely unconstrained in our analysis, we are in full agreement with Buchanan's position that *choice influencing* opportunity costs are entirely subjective. In other words, how exactly particular individuals calculate the values of their alternatives *ex ante* and whether they calculate their expected opportunity costs at all is irrelevant to our analysis. What is relevant is the assumption that effectuators see *X* as transformable and not completely pre-determined.

In a green/blue world, alternatives matter in a different way than in a grue world. In the former, alternatives are searched for and drawn from a universe of all possible alternatives – i.e. in this world, commitment to *X*, is a commitment to *X* as the goal of action, and the allocation of

¹ Because proponents of Austrian economics have built upon Buchanan's views on this subject, it might be dismissed as not well received in mainstream economics. But Buchanan is very much in line with leading economists such as Hayek and Coase, and as Hartmut Kliemt notes in the Foreword to the book, ... Buchanan distances himself somewhat from the Austrians. Avoiding what he regards as the "arrogance of the eccentric," Buchanan makes a serious effort to integrate his views into the orthodox classical and neoclassical framework.

resources is between alternative means to achieve the pre-selected goal. In the latter, alternatives are envisaged as possible transformations of existing realities – i.e. commitment to X is a commitment to a certain *course* of action x_i that may or may not lead to any envisioned X .

In this regard, our positions on ends and goals may be worth clarifying. Our analysis is consistent with the fact that goals exist in hierarchies (Simon 1964). Also, while goals at the highest levels might be clear, their operationalizations at lower levels may be highly ambiguous. Take for example the motivations of an entrepreneur who may want to make \$40M by age 40. This ‘goal’ while it may appear specific and clear is not easy to translate into immediate sub-goals that can actually be acted upon – i.e. it does not provide a compelling reason for the entrepreneur to commit to any particular X . In this sense, an actor may experience high levels of goal ambiguity even in the face of a clear vision of what s/he wants down the road.

Our analysis is also consistent with questioning the assumptions that underlie the idea that human action can best be understood as the pursuit of pre-conceived goals. As Joas (1996) observes, some of the greatest thinkers of the twentieth century including Dewey, Heidegger, Merleau-Ponty, Wittgenstein, and Ryle have challenged those assumptions, and have argued for

...the impossibility of defining human life as a whole in terms of chains of means and ends. ...If we summarize these admittedly quite discrete arguments showing the limited applicability of the means-ends schema, we find that neither routine action nor action permeated with meaning, neither creative nor existentially reflected action can be accounted for using this model. (pp. 156)

Instead, Joas locates human action firmly within the continual interaction of the human body (corporeality) with the real world (situation) and with other people (sociality):

The means-ends schema cannot be overcome until we recognize that the practical mediacy of the human organism and its situations precede all conscious goal-setting. A consideration of the concept of purpose must ineluctably involve taking account of the corporeality of human action and its creativity. (pp. 158)

In a green/blue world, choice of ends precedes choice of means; in a grue world, as we saw in the case of the effectual network, ends are *outcomes* of action that depend at any given point in time on particular actors, and the immediate transformations they commit to.

In terms of our analysis of grue markets, we need to consider two sets of goals, one consisting of the goals of individual members, and the other that of the effectual network. While individual members may have a variety of goals in different hierarchical schemes with different levels of ambiguities, the network's goals are always particular transformations on *X*. Therefore, only those individual goals would be relevant to the analysis that any given member can *embody* in particular transformations on the extant artifact. A lucid illustration of this can be found in Lindblom (1959). When lawmakers sit down to draft a bill on say, partial birth abortion, their prior positions on the issue are relevant only to the extent that they agree or disagree about particular provisions of the bill, sometimes only to the extent of individual clauses. Therefore, even arch opponents on principles can come together at the margin on particular provisions and end up with a draft of the bill both sides can live with. And those who may be ambivalent at the level of principles can commit to particular provisions without first resolving their confusions as to the larger values involved. Similarly, for our analysis, we do not need to make any precise assumptions on individual preferences and goal clarity. Only the actual commitments the stakeholders make to particular transformations of *X* drive the fabrication of the new market. Reasons for making commitments may range from pre-existent preferences to docility, passions and convictions to self-interest and fun, reformatory zeal to indifference.

Furthermore, each individual commits only what s/he can afford to lose to make those particular transformations. This is especially true in the initial stages of the network since it is far from clear what *X* will eventually turn out to be, let alone what it would be worth. Therefore,

any calculations of expected return, even if actually carried out by members of the network, can be considered highly speculative *guesstimates* at best. Effectuators, therefore, tend to focus instead, on the down side – i.e. how much they are willing to lose on investing in the effectual commitment. This calculation of affordable loss need not depend on any predictive assessment of the value of *X*. Instead, it can almost entirely be based upon a variety of things that effectuators already know, such as, their current net worth, reliable sources of future income streams, personal expense requirements, commitments already made to others, and so on. Making a commitment based upon affordable loss calculations minimizes (and can even eliminate) reliance on predictive information.

As we shall see next, a similar non-predictive logic undergirds ignoring opportunity costs in the commitment to *C*.

Commitment to *C* and not *D*: The problem of opportunity costs

The key to the effectual commitment – i.e. the reduction of Type I errors even at the cost of Type II errors – is that it does not *predict* but actually *sorts* prospects into customers and non-customers, or more specifically, into stakeholders and non-stakeholders. Each stakeholder comes on board the network by actually committing to and investing in particular local shapes and features of the emerging new market, subject to the constraints of everyone else already on board. In other words, every new member who actually comes on board either re-shapes the market to the extent they can persuade others to change their views or re-shapes their own preferences to the extent they are docile toward the views of the others. Notice that we are not suggesting a new “charisma” theory of entrepreneurship, although some members of the network may indeed be more charismatic than others. Instead, we rest our claims upon the fact that *all* human beings, leader and member alike, are (to varying degrees) persuadable (Simon, 1993).

Membership in the effectual network is not determined on the basis of who “should” come on board, but is rather determined by who “can” come on board subject to both the global constraint of transforming a grue market and the pool of local constraints that have been negotiated thus far. Some of these constraints are lumpier than others. For example, any non-reversible investments such as those involved in R&D reduce the fluidity of the pool and lower its ability to blend in the contributions and constraints of potential new members. Eventually some lumpy constraints coagulate into a stable local structure that forms a non-negotiable part of the new artifact. New members now have to negotiate with this stable structure as a single unit and new pools of contributions and constraints have to evolve *around* this structure, forming hierarchies of stable structures in the growing artifact.

Through each of these stable structures, within the constraints outlined, the effectual network seeks to control the shape of the future to the extent it is controllable through human action. In other words, the effectual network, especially in the initial stages, does not have any global criteria with which to evaluate the worthiness or otherwise of any particular prospective member. New membership is merely contingent on actual local constraints negotiated with and within current membership. A negotiation that results in actual commitments is the *only* criterion that determines membership in the network. Therefore, the notion of any objective opportunity costs to membership selection is largely irrelevant because selection in an effectual network is largely a process of *self-selection*, given constraints already at work in the transformation of *X*. In this way, the rejection of opportunity costs with regard to *D*, also rejects the notion of the actual market being one of many possible markets, and incorporates the overall grue weltanschauung in which new markets are made from existing components in the actual world.

In common sense terms, the decision to ignore *D* is a function of the uncertainty associated with the market for *X*. If *D* exists and is known with reasonable certainty to be a customer or supplier for *X*, then it would not make sense for *C* and *E* to proceed as though *D* does not exist. But in most new markets, there is considerable uncertainty with regard to the existence of *D*. This is where the *effectual* logic underlying the network becomes manifest and relevant. Given that *E* is already involved in the creation of green *X* and *C* is already interested in blue *X* (for reasons irrelevant to our analysis as we showed in the previous section), we can consider two cases:

- Either *C* and *E* can proceed causally – i.e., as though there exists a market consisting of *D* for *X* (green and/or blue) largely independent of their particular decisions, in which case, they will have to be careful to align their choices with what this market consists of. Ergo, they need to invest in search processes for finding *D* -- i.e., the best possible sources for customers of green *X* and suppliers of blue *X*.
- Or, they can proceed effectually – i.e. as though the market is a *result* of particular actions they take, subject to the possibility of exogenous shocks, and the necessity to modify their own selections as the market comes into existence. In this case, they can proceed to make the commitments they negotiated with each other knowing that they may have to renegotiate the shape of *X* if *D* exists and is willing to commit whatever is necessary to come on board later.

So while the market in which *D* comes on board and one in which *D* does not come on board would be very different from each other, there is no *a priori* way to decide which of those two markets would be *better* for *C* and *E* to participate in. Instead it makes sense for them to negotiate with any and all members who actually make the commitments required to come on board. In sum, the *calculable* opportunity costs of *not* partnering with *C* always outweigh the incalculable opportunity costs of not partnering with imagined *D*'s elsewhere. Effectually speaking, the bird in hand is always worth more than imagined birds in mythical bushes.

So far, with regard to the commitment to *C*, and not *D*, we have shown the irrelevance of opportunity costs in the formation of the effectual network. But what about the problem of opportunism?

Commitment to C: The problem of opportunism

Our analysis is fully consistent with social networks theories on the role and salience of existing ties for each stakeholder in the effectual network. This is reflected in the fact that effectuators begin with who they are, what they know, and whom they know. But in line with a grue universe, our analysis goes beyond the idea that extant networks can be leveraged and managed, to encompass the notion that new networks can also be initiated and developed. We use a simple typology of how new networks may be initiated:

- Networks may form through random chance (Ex: Two or more people bump into each other at the mall or happen to sit next to each other on an airplane)
- Networks may form in some path dependent fashion (Ex: Through garbage cans). These can be intentional or unintentional
- Networks may form through the deliberate activation of an existing network – again either with regard to achieving a pre-determined goal (causal initiation) or by imagining ways to exploit an extant network (effectual initiation)

The history of entrepreneurial new market creation is full of unusual partnerships leading to the emergence of new networks. Instead of arising naturally as a consequence of existing social networks, several of these seminal relationships began as intentional or co-incidental garbage cans (Cohen et al 1972), such as the one in which Clark and Andreesen, the founders of Netscape, met. Josiah Wedgwood, too, was introduced to Bentley through his physician while he was laid up in bed in Liverpool for many weeks from a knee injury. As Koehn (1997) describes it, “This meeting was a fortuitous one for both men. It inaugurated a long friendship of great depth and intimacy, as well as one of the most important business partnerships of the eighteenth century.”

But the idea of initiating new networks begs the question about the role of social networks as the primary arbiters of trust in exchange relationships. Current theories of economics and organizations wrestle with the contradictory behavioral assumptions of opportunism and trust. Opportunism, defined as self-interest seeking with guile (Williamson,

1985), is a fact about human behavior. As is trust, defined as affect-based belief in moral character (Wicks, Berman & Jones, 1998).

Sociologists have tried to leap across this divide by positing a *tertius gaudens* of one kind or another, who through the good fortune of his/her position in a social network acts as an arbiter of trust and legitimacy between two opportunistic parties. Coleman (1990), for example, identifies the entrepreneur as an arbiter of trust, while Olson (1986) points to the government, as the *tertius gaudens* of ultimate resort.

Based on a detailed review of the vast literatures on this subject that we will not present in this paper, we conclude, in line with several scholars in the field (Rabin 1998, Simon 1993, Moran and Ghoshal 1996, Mosschandreas 1998), as follows: Both the volume of theorizing and the weight of empirical evidence suggest that it might be fruitful to move away from strong behavioral assumptions of either opportunism or trust-based ties toward a more realistic starting point – namely, that in most cases at the beginning of the formation of a network, actors simply cannot predict the motives of those they interact with nor can they always predict their *own* motivations. That is why it makes sense for effectuators to rely on actual commitments rather than on predictions based on past behavior, or promises endorsed by third parties.

In the effectual network, only those members who make actual commitments form the membership of the network. This provides a substantial deterrent to free riders and opportunists. Furthermore, by requiring a large amount of willingness to change the shape of *X* without guarantees of larger shares of the eventual pie, the effectual network tends to select out opportunists and select in intelligent altruists including those who persuade others to be altruistic. Also, opportunists have real opportunity costs in the form of other more predictable markets with low hanging fruit (as opposed to those under construction through effectual networks). Joining

and working with an effectual network requires them to forgo those other opportunities that provide more immediate and surer gains. To a great extent, therefore, effectual networks eradicate the need to *overcome* opportunism, by merely making it irrelevant to the creation of new markets.

Note that this does not mean that the very same members of the effectual network who behave in an intelligently altruistic fashion in the beginning will not behave opportunistically as the market coalesces into more predictable outcome distributions. All that the effectual network does is to cue in intelligent altruism at the earlier stages, leaving open the possibility of opportunistic behavior later in the development of the market. This is very much in keeping with an evolutionary explanation for the concurrent existence of opportunism and altruism in human behavior. As Thompson (1998: 305) states:

Because selection has sometimes favored individualistic and at other times collectivist behavior, the human species has evolved not only the capacity for both kinds of action but probably also a complex cognitive device for figuring out in a given situation which kind of action, collective or individualistic, is likely to produce the best genetic outcome.

CONCLUSION

We started out trying to understand how an entrepreneur/manager can act in a world where markets are *grue*. We showed that forging a network of stakeholders based on actual commitments to particular transformations of extant realities into components of the new market entails an effectual logic – i.e., a logic that allows *who comes on board* to determine what the new market will look like, rather than let predicted visions of the new market drive the search for and selection of new members,. We end by presenting a provocative argument as to why acting as though the world were *grue* matters.

Arguing from a pragmatic philosophical standpoint (a la Davidson, 1986) that people can and do understand about other people's minds and feelings through comparisons with their own,

Sen (1999) insisted in his Nobel lecture that a *constructive* social choice theory would be possible that would reject the received wisdom of welfare economists on the impossibility of inter-personal comparisons of utility (IPCU). He posed two questions that need to be answered in building a constructive social choice theory. The first assumes IPCU is possible and asks whether something as complex as IPCU can be incorporated into our formal theorizing. His answer to this question is a resounding, “Yes!” The second question asks, “On what kind of information can we sensibly base IPCU?” Here he suggested that the answer has to combine epistemology with practical reason and called for a reexamination of the informational basis for interpersonal comparisons.

To begin examining how the model of effectual interaction described in this paper could feed into such a reexamination, we look to Davidson, as suggested by Sen. In a landmark thesis titled *Subjective, Intersubjective, Objective* the philosopher Davidson (2001) consolidated a lifetime of trying to understand topics in the philosophy of mind from a variety of areas such as semantic theory, epistemology and ethics into a series of essays culminating in an article titled *Three varieties of knowledge*. The Stanford encyclopedia of philosophy states:

In ‘Three Varieties of Knowledge’, Davidson develops the metaphor of triangulation into the idea of a three-way conceptual interdependence between knowledge of oneself, knowledge of others and knowledge of the world. Just as knowledge of language cannot be separated from our more general knowledge of the world, so Davidson argues that knowledge of oneself, knowledge of other persons and knowledge of a common, ‘objective’ world form an interdependent set of concepts no one of which is possible in the absence of the others.

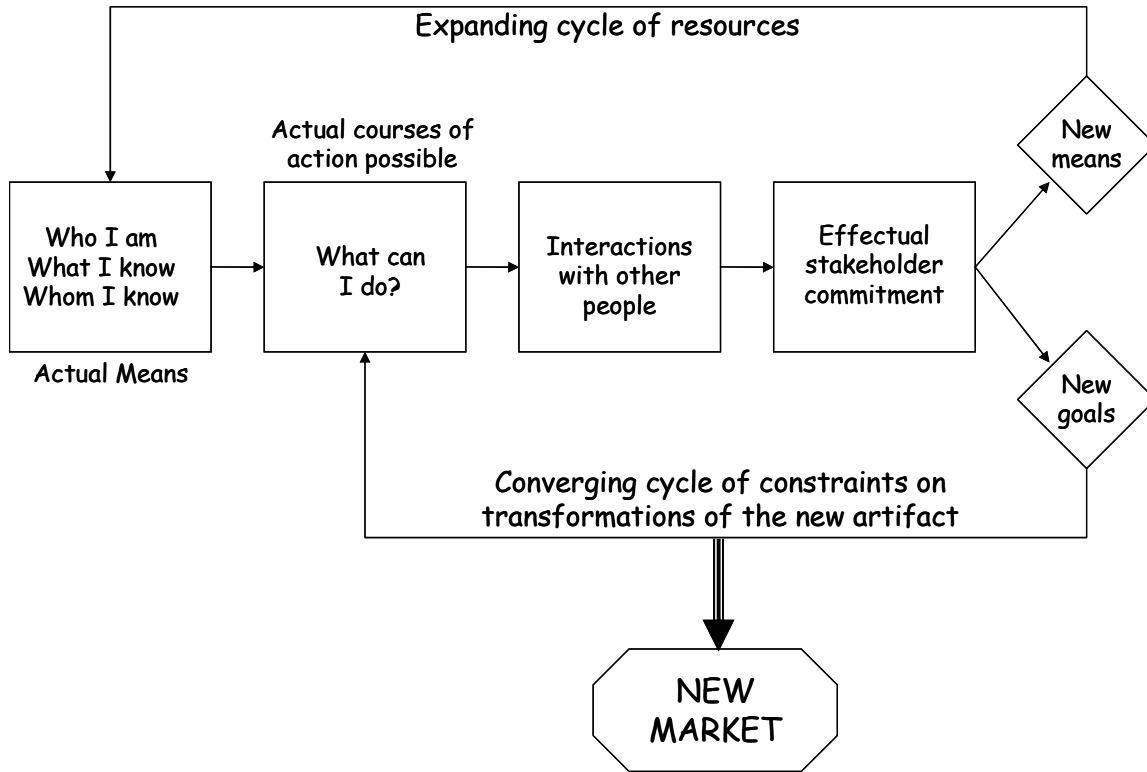
The effectual logic of acting in a grue world that we have developed in this paper leverages the three-legged structure of uncertainty – *three varieties of ignorance*. The effectual commitment overcomes *objective ignorance* – namely, Knight’s ‘true’ uncertainty (ignorance of what probabilities to assign) and the more recent problem of isotropy (ignorance of the relevance of particular pieces of information to the problem at hand) -- by

first limiting the actor to the known (who I am, what I know, and whom I know) and the possible (what I can actually do); and then making the selection within this small set dependent upon the next stakeholder who makes an actual commitment to transform this set in a particular way. The effectual commitment further overcomes *intersubjective ignorance* – namely, the lack of knowledge about how opportunistic or trustworthy the other party to the interaction is – by proceeding strictly on the basis of actual commitments, even to the exclusion of other possible commitments; and finally, it turns *subjective ignorance* – i.e., goal ambiguity into an asset, that enables the known and the actually possible for each individual actor to be embodied into effectual commitments that specify what the new artifact – i.e. the new market – will be.

In thinking through a philosophical basis for the growing scholarship on new markets, this paper outlines a descriptive theory of how a new market comes to be. The theory makes minimal assumptions about human behavior and interaction, and has been empirically evidenced elsewhere (Sarasvathy, 1998; Dew, 2003). It is also a prescriptive theory for action under three varieties of ignorance that does not entail fuzzy concepts such as intuition, much pilloried “deviations” from rationality, or reliance on predictive calculations resting on unreliable assumptions. But much work remains undone in terms of relating our prescriptions to measures of performance. While we hope to undertake some attempts in that direction in the future, we restrict ourselves to two speculative hypotheses here: First, we suspect that our model is more about reducing the costs of failure than about increasing the chances of success; and that leads to our second suspicion that our model argues for a *method* of reconciliation of social equity and economic efficiency in the macro-environment in line with Sen’s (1999) suggestions for a solution to the social choice problem.

FIGURE 1

A Dynamic Model of the Effectual Network and the New Market as an Effectual Artifact



APPENDIX 1

Reid (1997)

In early 1994, Bill Foss loaded Mosaic (the world's first web browser created by Marc Andreessen) onto his computer and watched as Jim Clark clicked his way through the internet. As Reid (1997) describes it: *It was Clark's first glimpse of the Web. Before he was done, he E-mailed Marc. You may not know me, but I'm the founder of Silicon Graphics, his message began.* Reid goes on to explain that the first few meetings between the two men did not go very well: *Foss remembers Marc as "this kind of ungainly twenty-two-or twenty-three-year-old kid [who] doesn't quite know what to make of this corporate culture, so he's put a tie on" (ties were passenger-pigeon rarities in the corridors of the company Clark had founded)... But.. Marc "kind of built up his comfort level with Jim" over the subsequent weeks, Foss recalls.*

Stanford website

Clark left Silicon Graphics in January of 1994 with the vague intention of starting a new software company, perhaps involving interactive television. Near the end of his time at SGI, colleague Bill Foss showed Clark a new program he found. That program was Mosaic. Clark was smitten, and he took note of a Mosaic page showing Andreessen and where he was. Clark contacted Andreessen and the two met, with excellent results. "He was one of the sharpest people I had ever run across," Clark told the San Jose Mercury News. And Andreessen's reaction to Clark, "His vision, knowledge about markets and ability to execute were right on target." The two discussed various business opportunities and developed no sure-fire money-making idea, but in the end Clark's entrepreneurial spirit could not be checked. "You think of something to do," Clark instructed Andreessen, "and I'll fund it."

For Andreessen, there was no reason not to join forces with Jim Clark. Friction had been building between the NCSA management and the Mosaic programmers for several months, and Andreessen was looking for a way to get out. Management issued glowing press reports about Mosaic, but declined to mention Andreessen or the other programmers in any great detail, thus preventing them from receiving the accolades which they were due. In essence, the young team of Mosaic programmers saw themselves as under-paid, under-appreciated, and overworked.

Andreessen soon left the NCSA to found Mosaic Communications Corporation. Shortly thereafter he sent e-mail to his former colleagues: "Something's going down. Be ready to move."

The company was born.

Maney (2003) – In USA Today

At NCSA in 1993, Mittelhauser and Totic recall, Andreessen got fed up with battles over Mosaic, so he left for Silicon Valley. Marc was like an ongoing soap opera," Totic recalls. "He got this pathetic job where he was, like, an intern, and he was e-mailing us daily dispatches. Then one of them said that he'd met Jim Clark. We were all like, 'Who's Jim Clark?'"

In one of those small but pivotal events in history, Bill Foss, an assistant to Clark at computer maker Silicon Graphics, then one of the Valley's most exciting names, had told Clark he should e-mail Andreessen. Foss had followed Mosaic and knew Clark was casting about for another company idea. But Clark barely knew anything about the Internet. At SGI, he'd worked mostly on the hot field of interactive television. Andreessen was sick of Mosaic and wanted to do something else. "We had two business plans," Andreessen says. One was in interactive TV. The other was to build an online gaming network for Nintendo machines.

One day, Clark says, he and Andreessen were in Clark's living room, struggling over ideas. Andreessen said he wanted to work with his NCSA buddies but was afraid they'd get recruited somewhere else. "Right there, in that moment, we said, 'Let's reproduce Mosaic,'" Clark says. "We hopped on a plane and flew to Illinois in the middle of a thunderstorm. We met the (rest of the NCSA gang) at a hotel and recruited them in 24 hours, and suddenly we had a company." To celebrate, "We all went to the hotel bar," Totic says. "I remember there was a lot of Jägermeister."

REFERENCES

- Abrams, J. J. 2002. Solution to the problem of induction: Peirce, Appel and Goodman on the Grue paradox. *Transactions of the Charles S. Peirce Society* Vol XXXVIII 4:543-558
- Adner, R., 2002. When are Technologies Disruptive? A Demand-based View of the Emergence of Competition. *Strategic Management Journal* 23:667-688.
- Akeroyd, F.M., 1991. A Practical Example of Grue. *The British Journal for the Philosophy of Science*. Vol 42 (4): 535-539.
- Arrow, K. J. 1962. Economic welfare and the allocation of resources for inventions. In R. Nelson (ed.), *The Rate and Direction of Inventive Activity*. Princeton, NJ: Princeton University Press.
- Arrow, K. J. 1974a. Limited Knowledge and Economic Analysis. *American Economic Review* 64(1): 1-10.
- Arrow, K.J., 1974b. *The Limits of Organization*. New York: Norton
- Aversi, R. Dosi G, Fagiolo G, Meacci M, Olivetti C, 1999. Demand dynamics and socially evolving preferences. *Industrial and corporate change* Vol 8 No. 2:353-408.
- Axelrod, R. and Cohen, M.D. 2000. *Harnessing Complexity*. Free Press.
- Bala, V. and Goyal, S., 1994. The Birth of a New Market. *Economic Journal* 104:282-290
- Barnett, W. P., and Sorenson, O. 2002. The Red Queen in organizational creation and development. *Industrial and Corporate Change* 11(2): 289-328.
- Bianchi, M. (Ed.), 1998. *The Active Consumer*. London: Routledge.
- Bikhchandani, S., Hirshleifer, D. and Welch, I., 1992. A theory of fads, fashions, custom and cultural change as informational cascades. *Journal of Political Economy* 100: 992-1026.
- Buchanan, J.M., 1969. *Cost and Choice*. Chicago: Markham.
- Carpenter, G. S., and Nakamoto, K., 1989. Consumer Preference Formation and Pioneering Advantage. *Journal of Marketing Research*:285-298.
- Carroll, G.R., 1997. Long-term evolutionary changes in organizational populations: theory, models and empirical findings in industrial demography. *Industrial and Corporate Change*, 6:119-143.
- Casson, M., 1982. *The Entrepreneur: An Economic Theory*. Cheltenham, UK: Edward Elgar
- Christensen, C., 1997. *The Innovator's Dilemma*. Cambridge: Harvard Business School Press.
- Coase, R.H. 1988. *The Firm, the Market and the Law*. Chicago: University of Chicago Press.
- Cohen, M. D., March, J. G., & Olsen, J. P. 1972. A Garbage Can Model of Organizational Choice. *Administrative Science Quarterly* 17: 1-25.
- Coleman, J. S. 1990. *Foundations of Social Theory*. Harvard University Press.
- David, P., 1969. A Contribution to the Theory of Diffusion. *Stanford University*, mimeo.

- Davidson, D. 1986. Judging inter-personal interests. In J. Elster & A. Hylland (Eds.). *Foundations of social choice theory*. Cambridge, Cambridge University Press: 195-211.
- Davidson, D., 2001. *Subjective, Intersubjective, Objective*. Oxford, UK: Oxford University Press.
- Debreu, G., 1991. The Mathematization of Economic Theory. *American Economic Review*, 81:1-7
- Dew, N. 2003. *Lipsticks and Razorblades: How the Auto ID Center used Pre-commitments to build The Internet of Things*. Dissertation, University of Virginia, Charlottesville, VA.
- Dosi G. 1982. Technological Paradigms and Technological Trajectories. *Research Policy* 11:147-162.
- Douglas, M, 1979. *The World of Goods*. London: Routledge.
- Earl P. 1998. Consumer Goals as Journeys into the Unknown. In Bianchi, M. (ed.), *The Active Consumer*. London: Routledge.
- Economides, N. and Siow, A., 1988. "The Division of Markets is Limited by the Extent of Liquidity: Spatial Competition with Externalities," *American Economic Review*, vol. 78, no. 1, pp. 108-121.
- Fligstein, N. 2002. *The Architecture of Markets, An Economic Sociology of Twenty-First-Century Capitalist Societies*. Princeton: Princeton University Press
- Fodor, J.A., 1987. Modules, Frames, Fridgeons, Sleeping Dogs, and the Music of the Spheres. In Pylyshyn, Z.W. (Ed.) *The Robot's Dilemma: The Frame Problem in Artificial Intelligence*. Norwood, NJ: Ablex
- Folger, R. 1999. Theorizing as the thickness of thin abstraction. *Academy of Management Review*, 24: 742-759.
- Geroski, P.A., 2000. Models of technology diffusion. *Research Policy* 29:603-625
- Geroski, P.A., 2002. *The Evolution of New Markets*. Oxford: Oxford University Press.
- Gilriches, Z., 1957. Hybrid corn: an exploration in the economics of technical change. *Econometrica* 48:501-522.
- Goodman, N., 1978. *Ways of Worldmaking*. Indianapolis, IN: Hackett.
- Goodman, N., 1983. *Fact, Fiction and Forecast*. Cambridge, MA: Harvard University Press.
- Granovetter, M. 1985. Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology*, 91, 481-510.
- Gort, M. and Klepper, S., 1982. Time Paths to Diffusion of Product Innovations. *Economic Journal* 92:630-653
- Gualerzi D. 1998. Economic Change, Choice and Innovation in Consumption. In Bianchi M. (ed.). *The Active Consumer*. London: Routledge.
- Helpman, E. (ed.), 1998. *General Purpose Technologies and Economic Growth*. Cambridge: MIT Press

- Jensen, O. W. 1982. Opportunity costs: Their place in the theory and practice of production. *Managerial and Decision Economics*. 3(1): 48-51
- Joas H., 1995. *The Creativity of Action*. Chicago: Chicago University Press.
- Kirzner, I. 1973. *Competition and Entrepreneurship*. Chicago and London: The University of Chicago Press.
- Koehn, N. F. 2000. *Brand New*. Cambridge, MA: Harvard University Press.
- Kotler, P. 1994. *Marketing Management*. Prentice Hall.
- Lancaster, K. 1971. *Consumer demand; a new approach*. New York: Columbia University Press.
- Leiner, B. M., Cerf, V. G., Clark, D. D., Kahn, R. E., Kleinrock, L., Lynch, D. C., Postel, J., Roberts, L. G., and Wolff, S. 2002. A brief history of the internet. <http://www.isoc.org/internet/history/brief.shtml> Internet Society
- Levinthal, D. (1991). Organizational adaptation and environmental selection: Interrelated processes of change. *Organization Science*. 2: 140–145.
- Lindblom, C. E. 1959. The science of muddling through. *Public Administration Review*. 19: 79-88.
- Loasby, B. J., 1999. *Knowledge, Institutions and Evolution in Economics*. London: Routledge.
- McMillan, J., 2002. *Reinventing the Bazaar: A Natural History of Markets*. New York: Norton.
- March, J.G., 1991. Exploration and exploitation in organizational learning. *Organization Science*, v2, n1:71-87.
- Malerba, F., Nelson, R., Orsenigo, L., and Winter, S. 1999. 'History-friendly' models of industry evolution: The computer industry. *Industrial and Corporate Change*. 8 (1): 3-40.
- Maney, K. 2003. 10 years ago, who knew what his code would do? USA Today. http://usatoday.com/money/industries/technology/2003-03-09-internet_x.htm
- Menard, C., 1995. Markets as Institutions versus Organizations as Markets? Disentangling some fundamental concepts. *Journal of Economic Behavioral and Organization*, Vol 28:161-182.
- Michael, R.T. and Becker, G.S., 1976. On the New Theory of Consumer Behavior. In Becker, G.S., *The Economic Approach to Human Behavior*. Chicago: University of Chicago.
- Miller, K. D. and Folta, T.B., 2002. Option Value and Entry Timing. *Strategic Management Journal* 23:655-665.
- Mokyr, J., 1990. *The Lever of Riches: Technological Creativity and Economic Progress*. New York : Oxford University Press.
- Moran, P. & Ghoshal, S. 1996. Bad for practice: A critique of the transaction cost theory. *Academy of Management Review*. 21: 13-48.
- Moschandreas, M. 1997. The Role of Opportunism in Transaction Cost Economics. *Journal of Economic Issues*, 31: 39-58.

- Murmann, J. P. 2003. *Knowledge and Competitive Advantage: The Coevolution of Firms, Technology, and National Institutions*. Oxford University Press.
- Nelson, R. R. 1991. Why Do Firms Differ, and How Does It Matter? *Strategic Management Journal*. 12: 61-75.
- Nelson, R.R., 1995. Recent Evolutionary Theorizing about Economic Change. *Journal of Economic Literature* Vol 33:48-90
- North, D. C., 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.
- Olson, M. and Kahkonen, S., 2001. *A Not-So-Dismal Science: A broader view of economies and societies*. Oxford: Oxford University Press.
- Olson, M. 1986. Toward a More General Theory of Governmental Structure. *The American Economic Review* 76: 120-125.
- Porter, M.E., 1980. *Competitive Strategy*. New York: The Free Press.
- Rabin, M. 1998. Psychology and Economics. *Journal of Economic Literature* 36: 11-46
- Reid, R. 1997. *Architects of the Web*. New York: John Wiley & Sons.
- Robertson, P.L. and Yu, T.F., 2001. Firm Strategy, innovation and consumer demand: a market process perspective. *Managerial and Decision Economics* 22:183-199.
- Rogers, E. M. 1995. *Diffusion of Innovations* (5th ed.). New York: Free Press.
- Rosa J. A., Porac J. F., Runser-Spanjol J. and Saxon, M. S., 1999. "Sociocognitive Dynamics in a Product Market." *Journal of Marketing*, 63:64-83.
- Rosenberg, N., 1996. *Inside the Black Box: Technology and Economics*. Cambridge, UK: Cambridge University Press.
- Ruttan, V.W., 1997. Induced innovation, evolutionary theory and path dependence: Sources of technical change. *Economic Journal* 107:1520-1529.
- Ryan, B. and Gross, N. 1943. The diffusion of hybrid seed corn in two Iowa communities. *Rural Sociology*, 8 (1): 15-24.
- Sarasvathy, S. D., 1998. *How do firms come to be? Towards a theory of the prefirm*. Dissertation, Carnegie Mellon University, Pittsburgh, PA.
- Schmookler, J., 1966. *Invention and Economic Growth*. Cambridge, MA: Harvard University Press.
- Schumpeter, J. A., 1934. *The Theory of Economic Development*. Cambridge: Harvard University Press.
- Schumpeter, J. A. 1942. *Capitalism, Socialism and Democracy*, NY: Harper and Row.
- Sen, A. 1999. The possibility of social choice. *American Economic Review*, 89(3): 349-378.
- Shane, S., 2003. *A General Theory of Entrepreneurship*. Cheltenham, UK: Edward Elgar
- Simon, H. A., 1964. On the concept of organizational goal. *Administrative Science Quarterly*. v9,i1:1-22.

- Simon, H. A. 1988. *The Sciences of the Artificial*. 5th printing. Cambridge, MA: MIT Press.
- Simon, H. A. 1993. Altruism and Economics. *American Economic Review* 83: 156-161.
- Spulber, D.F., 1997. *Market Microstructure : Intermediaries and the Theory of the Firm*. Cambridge, UK: Cambridge University Press.
- Stigler, G. J., & Becker, G. S. 1977. De Gustibus Non Est Disputandum. *American Economic Review* 67: 76-90.
- Teece, D., Pisano, G. and Shuen, A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* 18: 509-533
- Tellis, G. J. & Golder, P. N. 2002. *Will & Vision: How Latecomers Grow to Dominate Markets*. New York: McGraw-Hill.
- Thompson, N.S., 1998. Reintroducing “Reintroducing group selection to the human behavioral sciences” to BBS readers. *Behavioral and Brain Sciences*, 21(2):304-305.
- Tirole, J., 1988. *The theory of industrial organization*. Cambridge, MA: MIT Press
- Tolbert, P.S. and Zucker, L.G. 1983, Institutional sources of change in the formal structure of organizations: the diffusion of civil service reform 1880-1935. *Administrative Science Quarterly* 28:22-39
- Uzzi, B., 1997. Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness. *Administrative Science Quarterly*, 42: 35-67.
- Venkataraman S., 1997. The Distinctive Domain of Entrepreneurship Research. In *Advances in Entrepreneurship, Firm Emergence and Growth* Volume 3:119-138. JAI Press.
- White, H., 1981. Where do Markets come from? *American Journal of Sociology* 87(3):517-47
- Wicks, A. C., Berman, S. L. & Jones, T. M. 1999. Toward a Conception of Optimal Trust: Moral and Strategic Implications. *Academy of Management Review*, 24: 99-116.
- Wildavsky, A., 1987. Choosing preferences by constructing institutions: a cultural theory of preference formation. *American Political Science Review*, Vol 81 (1):3-21
- Williamson, O. E. 1985. *The Economic Institutions of Capitalism*. New York: Free Press.
- Winter, S. G. 2000. The satisficing principle in capability learning. *Strategic Management Journal* 21: 981-996.