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New market creation through transformation*

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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? In this article we consider new market creation as a process involving 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.

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1 Introduction

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 (1974) admission, "Although we are not usually explicit about it, we really postulate that when a market could be created, it

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would be." This postulate rests on the more general logic of optimal decision making, based on the application of well-defined preferences to a known opportunity set.

But the scope for this type of decision making, even when extended to include systematic search, is severely limited. Evidence for limitations come not only from empirical observations of how people actually make decisions (Kahneman, 2003), but also from what we know now about how the brain works (Loasby, 2004) and how human cognition is bounded both by biological and ecological constraints (Gigerenzer and Todd, 1999). Several alternative models of decision making under uncertainty have been proposed, including heuristics – ready-made decision procedures or rules of thumb (Simon and Newell, 1958); routines – established practices that have worked well in the past (Nelson and Winter, 1982); institutions – collective norms and agreed-upon regulations on what to do and how to do it (North, 1990; Loasby, 1999).

This bounded cognition further operates under Knightian and Shacklean uncertainty, as well as Marchian goal ambiguity (Knight, 1921; Shackle, 1979; March, 1978). The only way bounded cognition can function at all under such circumstances is by bounding the uncertainty in the environment – by deeming irrelevant a wide variety of information that may be available. This then begs the question as to how relevance or irrelevance of particular pieces of information may be evaluated. One answer is that intelligent behavior consists in "satisficing" or limiting search processes to the first "acceptable" solution – i.e. to search very locally and in a contingent fashion. Another suggests developing internal capabilities specialized to certain types of cues. Cohen and Levinthal's (1990) notion of absorptive capacity is an example. A third solution consists in sticking with one's social networks to imitate and trade to find good solutions that satisfice.

Given that knowledge is always partial and dispersed among creatures of bounded cognition, and that entrepreneurial environments are filled with uncertainties of various kinds, what can we say about how new markets come to be? This article provides a constructive existence proof – i.e. one particular model of how new markets *could* come to be, without relying on neoclassical assumptions about human rationality, knowledge, and exhaustive search and selection processes. The proof was originally induced from two empirical studies of entrepreneurial expertise.

We see four contributions to the thriving literature on new market creation:

1. The article provides micro-foundations for new market creation that are based on bounded cognition and consistent with partial knowledge. This means that realistic constraints on decision maker and setting (both spatial and temporal) are taken into account.
2. The model assumes Knighian uncertainty, Marchian goal ambiguity and environmental isotropy. So no onerous assumptions about the shape of the problem space are made.
3. Our analysis moves from the individual through the inter-subjective to the social. Being both dynamic and interactive, it overcomes the need to focus on one level only while holding others constant.

4. The proposed existence proof is at the heart of the formation and development of new networks. In other words, it moves beyond static conceptions of social networks.

2 Bounded cognition and new market creation as search/selection

The "bounded" nature of human cognition is no longer a matter of doubt or controversy. It is recognized by economists and others alike that, as Simon (1982, p. 178) described it:

Each of us sits in a long dark hall within a circle of light cast by a small lamp. The lamplight penetrates a few feet up and down the hall, then rapidly attenuates, diluted by the vast darkness of future and past that surrounds it.

Bounded cognition implies that we can only attend to a few things at a time and that our planning horizon is short. Also, because relevant knowledge is dispersed across many individuals (Hayek, 1945) it is not fully accessible to any one actor. Ignorance, therefore, is a dominant input into human decision making (Kirzner, 1973) and as Simon and others have consistently stressed locality and contingency rule the decision domain (Simon, 1982).

The roots of bounded cognition lie in biological evolution. But the evolution of novel artifacts (new products, new ventures, new markets, for example) made by the cognitively bounded human has a slightly different type of evolutionary cycle. Loasby's exposition of how bounded cognition and partial knowledge within a highly uncertain environment manages to create interesting and valuable novelty in entrepreneurship forms the jumping off point for our analysis, and as such is worth quoting at some length:

> Thus a particular example of environmental selection among random biological mutations made possible a new evolutionary process that incorporated directed variation: intelligence was guided by will towards the solution of envisaged problems. However this process could not escape the context of uncertainty and so it was still governed, although in a different form, by the evolutionary principles of variation, selection and retention.
>
> This shared development at the level of the species greatly enhances the possibilities of distinctive development at the level of the individual, leading to the differential emergence of domain-relevant knowledge and skills, which are much less demanding of cognitive capacity and brain energy than general-purpose logical processing, against a continuing low-cost background of programmed bodily functions and brain operations. The conversion of novelty to routine releases capacity for creating further novelty. Hayek's analysis is an appropriate illustration of this sequence: though the physical order originated from sensory perception, it has led to innovations that could not have been produced without evading the constraints of the sensory order; nevertheless the sensory order is still essential to normal human activity. The evolutionary process has itself evolved; but it is nevertheless an evolution and not a revolution. This, we shall argue, is true of all innovation; discontinuities are never absolute.

> The conception of the human mind as an extensive cluster of quasi-decomposable and selective connections corresponds with Jason Potts' (2000) general proposition that the crucial fact about systems is the incompleteness of their connections. If connections are incomplete, then the performance of a system depends not only on what elements are included but also on the links between these elements and the connections to other systems. Performance may then be changed either by modifying the set of elements or by a rearrangement of connections, internal or external. Such changes are characteristic of intelligence and entrepreneurship. They cannot be achieved by purely logical processes, though logical processes may subsequently be invoked to check for consistency or to trace some of the implications. (Loasby, 2004, p. 9).

Loasby's arguments build upon the work of economists such as Smith, Knight, Shackle, Hayek and Simon and are consistent with both biological and industrial evolution empirically observed. They are further characteristic of a wide variety of generalized problems in human decision making. We seek to embody these ideas in the particular setting of the entrepreneurial creation of a new market.

Defining a "market" and the problem space for new markets

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, p. 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.

A simple example suffices to illustrate how the three categories work together in the definition of the term "market." 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 emeralds are 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.

New market creation as a search and selection process

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. Even though boundedly rational creatures may explore only a small portion of this universe 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. As Penrose (1959) pointed out, not only does exploration lead to the possibility of exploitation, but exploitation prepares the way for exploration to find new uses for enhanced resources, leading to the transformation of both resources and the ends to which they may be put. This is consistent with Loasby's analysis of bounded cognition and partial knowledge leading to valuable novelty.

But does such valuable novelty come to be through search, selection and adaptation only, or can it be the result of local *transformations* of extant realities? This question challenges the "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 article. It posits instead the *transformation* of current realities into new possibilities rather than search (however bounded or unbounded) and selection within exotic regions of the unknown. "Discontinuities," as Loasby argues, "are never absolute."

New market creation as a transformation process

Loasby's arguments embody in a curious way the worldview of the epistemologist and philosopher of mind, Goodman (1978)[1]: *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.*

As we have already seen, the actual world is highly uncertain, and the human agent has to produce valuable novelty from this uncertain world through his or her bounded cognition. Unless we grant that *all* interesting variations are either the result of random thrashing by limited agents, or that they are heroic revolutions engendered by exotic imaginings, we have to reckon with the notion of willful agents with complex motivations who recognize that they are among other intentional beings with whom they can work together to construct, as well as, select new possibilities. It is this empirical reality that we seek to embody and explicate in our existence proof. To accomplish this, we begin with a rather simple, but illustrative example of the creation of new markets – namely, 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

[1] For readers who are more philosophically minded, the entire exposition at the core of this article can be recast in terms of the Grue paradox that Goodman is very well known for. In other words, just as emeralds cannot be proven to be green or blue, our model of how new markets come to exist deals with the fact that markets are grue.

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.

First, from the supply side. How would a founder/developer of the original Internet discover its commercial potential? Second, from the demand side. How would a manager at Barnes and Noble discover the potential for retail distribution through the Internet? Third, from the standpoint of institutions. How would an organization such as Nasdaq transform itself into a virtual trading floor on the Internet?

It seems almost immediately obvious, given our understanding of markets today, that the various actors involved needed to explore a variety of possible markets and also stand ready to exploit those that have high predicted value. 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 commercialize the 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 all possible uses for the 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 Internet bookstore; or why Nasdaq could not envisage that 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 fact that in decisions and actions involving uncertain future consequences it is not always clear ex ante which pieces of information are worth paying attention to and which not (Fodor, 1987)[2]. In other words, a phenomenon that looks ex post either like an exploration of all possible Internet markets, or the exploitation of the Internet for commercial purposes, may instead be the result of a series of transformations on the original reality, caused by cognitively bounded and idiosyncratically motivated agents trying to solve a variety of problems in a local and contingent fashion.

Isotropy and bounded cognition

Isotropy has been studied by cognitive scientists, roboticists and philosophers of mind. The Stanford encyclopedia of philosophy explains Fodor's definition of the problem as follows:

> For the difficulty now is one of determining what is and isn't relevant. Fodor's claim is that when it comes to circumscribing the consequences of

[2] Of course, Knight (1921) and Hayek (1952) both emphasized the fact that the information individuals pay attention to depends on the classification system used to group instances, and that commitment to a particular classification scheme is unavoidable even if an individual is unaware he/she is making such a commitment. Simon (1957) went on to point out that perception itself depends on the classification system invoked. This argument also features in Kirzner's (1973) concept of the entrepreneur, where differential alertness is built on differences among the classification schemes invoked by entrepreneurs, either implicitly or explicitly.

> an action, just as in the business of theory confirmation in science, anything could be relevant. (Fodor 1983, p. 105). There are no a priori limits to the properties of the ongoing situation that might come into play.

While Fodor would argue that it is not clear ex ante what we should pay attention to because the environment is isotropic, some scholars have argued (e.g. Weick, 1979) that what economic actors pay attention to (which is limited, owing to their bounded cognition) helps enact their environments, which suggests that human action creates isotropy in the environment:

> What the decision makers attend to and enact, the cues they use, why they use those cues, their patterns of inattention, and their processes for scanning and monitoring all become more influential as sources of selection criteria. Reality as perceived by the members becomes more the source of selection within the organization than does reality as perceived by some omniscient, less involved observer. (Weick, 1979).

At the same time, practically speaking (a la Fodor), actors cannot know what to attend to and what to ignore.

The three types of uncertainty that define the new market problem space – Knightian uncertainty, Marchian goal ambiguity and environmental isotropy – necessitate some artificial bounds being put on the problem space for, as Shackle observed, "the boundedness of uncertainty is essential to the possibility of decision" (Shackle, 1969, p. 224, cited by Loasby, 2004, p. 13). In other words, economic actors have to make some commitments (Elster, 1979; Frank, 1988) that help bound the problem space, commitments which necessarily involve "pre-rational" mechanisms. How, where and why people commit to certain ways of bounding and organizing the problem space is subject to substantial variation, and many varieties have obvious potential for being mistaken for, "Whatever theory is then devised will exist by sufferance of the things which has excluded." (Shackle, 1972, p. 354). The essential point is well summed-up by Brian Loasby, who's work has delved at length into these themes:

> [If] we ask 'How do we know?' we shall find that we know by setting bounds to what we seek to know, and ignoring . . . what lies beyond. Of course this policy exposes us to the risk that our apparent knowledge will be invalidated by what we have shut out... Not only is knowledge necessarily bounded; the bounds are necessarily imprecise . . . We are surrounded by uncertainty, in Shackle's sense. (Loasby, 200,0 pp. 4–5; italics as per the original).

The desire to set bounds to uncertainty motivates the willingness of economic actors both individually and in their interactions with others to make commitments to bounds, either consciously or unconsciously (by default), explicitly or implicitly, deliberately or contingently. It is because such bounds have to be imposed that the concept of commitment features strongly in the bounding process. Commitments to some form or another of organizing problems is essential for meaningful action by, and interaction between, economic actors.

Often economic actors depend upon and leverage already existing economic structures which set bounds to uncertainty. Such structures are frequently described

as institutions, which are useful precisely because they supply procedures and premises which help economize on our bounded cognition. Again, to quote Loasby:

> Institutions are a response to uncertainty. They are patterns acquired from others which guide individual actions, even when these actions are quite unconnected with any other person. They economise on the scarce resource of cognition, by providing us with ready-made anchors of sense, ways of partitioning the space of representations, premises for decisions, and bounds within which we can be rational – or imaginative. They constitute a capital stock of other people's reusable knowledge, although, like all knowledge, this is fallible. (Loasby, 1999, p. 46)

Institutions are therefore one form of domain-limiting assumptions and procedures that economize in the face of bounded cognition, Knightian uncertainty and environmental isotropy. All such procedures are piecemeal, since there can be no generalized algorithm for procedures (Winter, 2004). So instead of using general purpose information processing, actors use domain-limited procedures, even though they have no way of knowing if these procedures are appropriate.

However, the fact that institutions are widely shared and readily accepted explains why actors are willing to commit to them either in their present form, or in some contingently transformed way. This sharing includes those institutions which underpin individual markets. Markets are "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, p. 170). Markets therefore make exchange cheaper than it would be without markets because market institutions reduce a variety of "frictions" (MacMillan, 2002, p. 9) that otherwise impose the costs of bounded cognition, uncertainty and isotropy on exchange. This includes reducing the costs incurred in developing new interactions between the demand and supply sides of the market, which often develop in a co-evolutionary fashion as exemplified, for instance, in Geroski's account of the evolution of new markets, where one prominent cognitive institution that conjoins the demand and supply sides of the market is the "dominant design" (Geroski, 2003; Utterback, 1994).

Fundamentally, the institutional tissues that connect the demand and supply sides of markets into co-evolving dynamics reduce the cognitive costs otherwise involved in developing new markets (Dopfer et al., 2004). New businesses can also be created much more easily when an institutional framework pre-exists that supports a new market precisely because the cognitive frameworks on which the market rests are already established, and do not represent a sheer free-riding / commons problem / multi-agent prisoner's dilemma (Olson, 1965). Entrepreneurs are therefore disposed to look for pre-existing frameworks that connect users and producers and use them wherever possible, and such use leads inevitably to transformations. In this sense, economic actors always start from the here and now, taking pre-existing institutions and transforming them for new purposes. Again, there is no way of knowing whether the transformed institutions are appropriate, any more than there was a way of knowing the old ones were appropriate, and often they are

not. But regardless, the bounding process is necessary and an inevitable part of any entrepreneurial project.

Because entrepreneurs and managers do deal with the problem of the creation of new markets on a regular basis, this raises the question of how entrepreneurs starting new ventures or managers of large corporations act given the problems of bounded rationality, uncertainty, ambiguity and isotropy? It seems obvious that they bound the decision space by some pre-rational means as a precondition of behaving intelligently in their environment, but *how*, and *using what logic*? And what difference does it make whether we suppose markets are created through a search and selection process within a space of all possible markets, or that they are the result of a series of transformations on extant reality? These two questions form the primary focus of the following existence proof[3].

3 New market creation as transformation: 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 a new market.

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.

Currently major threads of research in entrepreneurship are based on the 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

[3] An existence proof addresses the question of whether a solution to a given problem exists. The existence problem can be solved in the affirmative without actually finding a solution to the original problem. (Weisstein, 2005). We are using a single instance (a thought experiment) of how the new market creation problem *could be* solved at the micro level to argue there exists a general theoretical solution. Actually proving that general solution itself is outside the scope of this article.

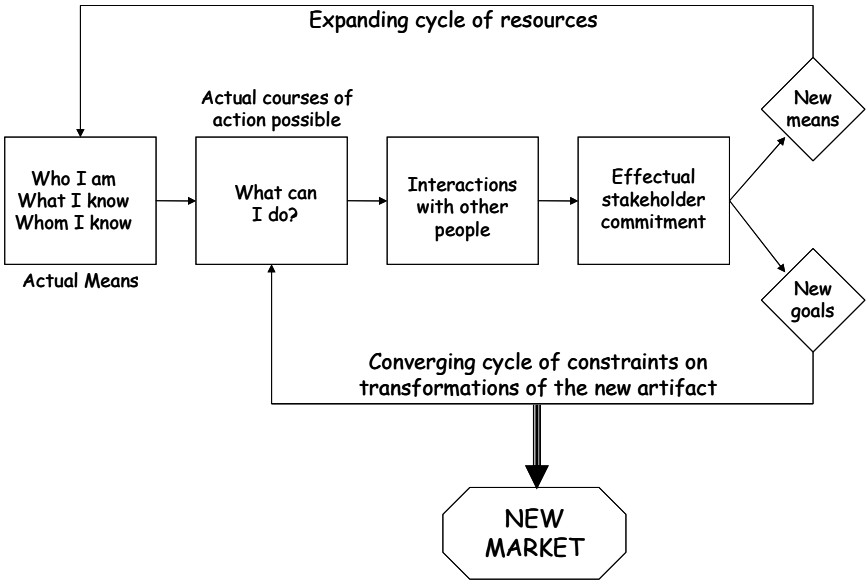

Fig. 1. A dynamic model of the effectual network and the new market as an effectual artifact

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 (Sarasvathy, 2001). 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[4].

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

[4] We do not wish to imply that entrepreneurs do not discover opportunities for new markets using a causal logic. In fact, business schools routinely teach their students to do it that way. Our aim is to show how opportunities can be created as well as discovered – especially, that new markets can actually be created using an alternate logic that is both coherent and useful.

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 a causal worldview, 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 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 a variety of things, say, 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 routine meeting events such as office parties or conferences).
> 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 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 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.

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[5]. 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 article]

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 (1982) 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

[5] Some parallels exist between our account here and recent work by Earl (2003) conceptualizing entrepreneurship as involving "the construction of new systems by forming connections that have not previously existed." We are grateful for an anonymous (and entrepreneurial?) reviewer pointing out these connections with Earl's work.

take the shape of the earth they need to scoop up at one end and the hands that hold them at the other (Simon, 1982).

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.

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 theoretical 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[6] :

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 needs to commit only what s/he can afford to lose, and need not calculate 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.

[6] These characteristics are elements of an effectual logic. For a book-length exposition of the key ideas in this paper and their application to entrepreneurship in general, see Sarasvathy (2005).

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.*

Commercializing the Internet through transformations

We emphasized earlier that the point of transformation in the context of new markets is not some arbitrary point, 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.

Now we turn to understanding the role of opportunism and opportunity costs in this crucial moment of transformation.

4 Opportunism and opportunity costs in effectual transformations

At the beginning of our analysis of the effectual commitment, we asked two questions. First, how can an entrepreneur/manager transform rather than search and select? 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 transformational, as opposed to that of search and selection is that in effectual transformations, the commitment to C trumps the commitment to X. In other words, through search and selection, 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 this case are chosen through processes of exploration – i.e. searching the space of possible alternatives (under standard assumptions of bounded rationality). The problem here 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 effectual transformations, 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 effectual 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 transformational actions from decision making through search and selection. Now the question for the effectual 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, p. 48). Buchanan[7], 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

[7] 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 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.

> 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.

Alternatives matter in a different way in effectual transformations than in search and selection processes. In the latter, 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 resources is between alternative means to achieve the pre-selected goal. In the former, 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. (p. 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. (p. 158)

In search and selection, choice of ends precedes choice of means; in an effectual 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 new 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 *embod*y 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[8].

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 (Akerlof and Kranton, 2005; Earl and Potts, 2004). 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 new 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 (Cyert and March, 1963). A negotiation that results in actual commitments is the

[8] We are grateful for an anonymous reviewer drawing our attention to the connection between the exposition here and Morgenstern and Von Neumann's (1944) game theory, which was explicitly designed to avoid reliance on predictive information, just as the thought experiment here is designed to do.

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 effectual worldview 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 an effectual 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 et al., 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 article, 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, p. 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.

5 Conclusion

We started out trying to understand how an entrepreneur/manager can act in a world of bounded cognition, partial knowledge and a variety of uncertainties in the problem space. 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 few good reasons as to why the particular model we present matters.

A number of scholars in evolutionary economics have articulated the necessity for developing rigorous and useful micro-foundations for the discipline (in particular, Dosi, 1997; Loasby, 1999). They contend that there is no theory of entrepreneurial/firm behavior that is consistent with the basic supply-push story of how new markets are created that has been articulated in evolutionary / Schumpeterian economics (Rosenberg, 1996; Klepper and Simons, 2000; Geroski, 2003). What emerges from comparing and cumulating the (by now) wide range of empirical studies on new market / industry founding is that the results are inconsistent

with the micro-theories based on which the data were analyzed. Some fundamental aspects of extant theories *must* be seriously mis-specified (Griliches and Mairesse, 1995; Dosi, 2004). In other words, conventional accounts of entrepreneurial/firm behavior (either maximizing or satisficing) do not mesh well with conventional accounts of industry founding. In particular, we have to reckon with at least two stylized facts:

One, consumer tastes are ambiguous / inchoate / ill-defined / evolving in new markets. This means the market cannot be found or predicted. Alternatively, even if we take tastes to be reasonably stable as Lancaster (1971) and Stigler and Becker (1977) model them, consumption technology is changing, i.e. consumers are learning-by-using a technology. Either way, what consumers want is ill-defined, so there is no well-articulated demand, and therefore no market, "out there" to be found or predicted (Langlois and Cosgel, 1993; Earl, 1998; Geroski, 2003, pp. 28–29). This challenges both the descriptive and prescriptive theories about firms doing market research to predict and innovate to pre-existent demand. Mowery and Rosenberg (1979) and Dosi (1997) have made compelling arguments against demand-pull theories in general. In sum, these arguments add up to the conclusion that abstract demand does not do much to influence the direction of innovation and the creation of new markets. It cannot.

At the moment, theories of market process have "black-boxed" this problem by assuming that different entrepreneurs / firms make different guesses about demand (e.g. Geroski, 2003, p. 46). In other words, we have the tautology that variation causes variation. But not only does this not "explain" much about how new markets come to be, it also is falsified by empirical evidence. Entrepreneurs do not "leave it" to differences in tastes or behavior to build markets. They work very hard to make tastes cohere and to concurrently embody them into particular transformations in real artifacts. While not all such artifacts may "succeed" down the road – i.e. while selection and retention over time may well be evolutionary, *almost all variations are non-arbitrary*. An effectual *logic* undergirds the creation of variation.

As scholars we have a decision to make. We can either use, as Milton Friedman did, Vaihinger's *as-if* philosophy to argue that for macro-theorizing we need only to proceed *as if* variations get generated randomly; or we can argue, as Simon argued, "that no self-respecting physicist would ignore observed facts." This will necessitate we roll-up our sleeves to build micro-foundations based upon the facts.

Two, the basic evolutionary view is that new markets are pushed-up from the supply side based on the transformation of existing artifacts; often based on transforming new technology into a marketable product. In particular, entrepreneurial firms create an enormous amount of product variation around the initial components of a new technology, i.e. product variation at the birth of markets is large. Different firms do business by bringing different products to the market. The argument that scholars have used so far is that this is a function of the fact that the technology is often new, so it is "wide open" to innovatory exploration of its various facets, and that consumer tastes are ambiguous (see above) so different firms make different guesses about what consumers really want.

But this "explanation" again "black-boxes" the process by which certain products are developed and not others. Taking an economic view, why does competition not lead firms to converge very quickly on the same product designs? Or in the sociological view, why don't the few and rare legitimation agencies quickly narrow the field to a few valuable new markets? Instead, what we actually observe is enormous variation. Effectuation illuminates these patterns of variation by showing how bounded cognition, partial knowledge and the necessity to commit along particular lines of the problem space work together to stitch together new markets piece by coherent piece. If individuals knew what they wanted (to the degree and precision that a neo-classical economist would like) and/or if the environment maximally constrained what agents could do (to the satisfaction of the die-hard sociologist), new market creation would actually be easier and happen faster than the facts warrant – bounded cognition notwithstanding.

But stitching together patch by patch, and building coherence commitment by commitment takes the time most markets take to coalesce – 15 years and counting in the case of the Internet for example (other examples: Gort and Klepper, 1982). Furthermore, the effectual logic at the heart of this inter-subjective process is empirically observable, theoretically feasible, and prescriptively useful in telling the troops what to do on the ground.

In sum, the effectual (non-predictive, non-adaptive, non-teleological) process of accumulating stakeholder networks through a chain of commitments undoes the black box. It shows us what's inside and how we can use the contents. And it does so in a way that is completely congruent with what we know about consumer preferences at the birth of new markets, i.e. that they are ambiguous, and therefore do not justify either predictions or guesses. Instead, entrepreneurs work out of means, use affordable loss, leverage contingencies and rely on stakeholder commitments.

Four decades ago, the behavioral theory of the firm helped open up the black box of established organizations. The seeds planted then have led to a rich tradition of research in evolutionary economics and a textured understanding of industry life cycles and the economics of new technologies. That research has also raised new questions about the creation of new markets. We hope our analysis begins to scratch the drawing board of a behavioral theory of the *entrepreneurial* firm that operates at the birthing place of new markets.

6 Appendix

Reid (1997)

In early 1994, Bill Foss loaded Mosaic (the world's first web browser created by Marc Andreesen) 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."

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