EFFECTUAL ENTREPRENEURIAL EXPERTISE: EXISTENCE AND BOUNDS

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SUMMARY

Recent theorizing in entrepreneurship has proposed effectuation as a baseline model of entrepreneurial expertise that goes beyond the "toolbox" of basic business skills such as market research and business planning. This study seeks to empirically delineate key elements of entrepreneurial expertise as compared with basic business knowledge. Think aloud protocols were extracted from 27 expert entrepreneurs and 37 MBA students who were asked to identify the market for a single new product. Analyses revealed that 89% of experts used effectuation more frequently than causation, while MBA students demonstrated a noticeably opposing preference, with 81% using causation more than effectuation.

KEYWORDS

Expertise, Effectuation, Uncertainty, Decision-Making, Bounded Rationality, Protocol Analysis

RUNNING HEAD

Effectual Entrepreneurial Expertise

INTRODUCTION

That entrepreneurs create firms is a simple fact. But that entrepreneurs often create firms in the *absence of markets* is an idea that has been gaining ground with researchers. For example, Venkataraman (1997: 126) identified this as a central phenomenon to be explained by entrepreneurship research. In a seminal article that brought this phenomenon to the attention of management scholars, Shane and Venkataraman (2000) pointed out the further complication due to the fact that much of the information required to bring new markets into existence itself does not come into existence until those markets are created (Arrow 1974). Thereafter, during an in-depth discussion of research perspectives in entrepreneurship, six eminent researchers -- Arrow, Kamien, Olson, Sexton, Simon & Venkataraman (1999) highlighted several intellectual issues of interest in entrepreneurship including the importance of decision-making in the absence of markets (Sarasvathy, 2000).

In an attempt to tackle this central research question in entrepreneurship, Sarasvathy (2001) proposed effectuation as the dominant model for entrepreneurial decision-making, particularly in the absence of pre-existent markets. Further theoretical development of effectuation theory has positioned it in the landscape of strategy making as useful in situations where predictability is low, but controllability of the situation is high (Wiltbank et al 2006). This paper seeks to empirically establish the existence of effectual reasoning in entrepreneurial decision making and to suggest bounds on its use as compared with business knowledge that embodies causal reasoning.

The next section briefly describes effectuation and outlines its theoretical precedents. Thereafter, the central hypothesis is developed and quantitatively tested through protocol analyses of the cognitive processes of 27 expert entrepreneurs and 37 MBA students who were asked to identify the market for a given new product. Finally, a more detailed qualitative content analysis of the protocols is used to inductively develop a process model of effectual reasoning and contrast it with causal models that form part of basic MBA education similar topics.

Results indicate that over 63% of the experts used effectuation more than 75% of the time. 78% of the MBA students did not use effectuation at all. Content analysis of expert protocols, in stark contrast to the novices, reveals an almost exact reversal of the commonly accepted marketing decision models based on causal reasoning. Causal reasoning prescribes that decision makers proceed by first identifying a potential market for a product and then devise marketing strategies to capture a sizable share of it through the segmentation-targeting-positioning process (Kotler, 1991). As expected, this process was followed by the MBA students two thirds of the time. The experts in this study, however, used effectual reasoning to: (i) start with a single customer; (ii) generalize the profile of that customer into a larger segment; (iii) add segments in an iterative fashion; and, (iv) end up literally *creating* a market for their product. In fact, starting with the exact same product, the 27 expert entrepreneurs ended up building 18 different companies many of them in completely disparate industries, where the 37 MBA students created fewer than half as many different companies.

CENTRAL HYPOTHESIS: EFFECTUATION AND ENTREPRENEURIAL EXPERTISE

Effectuation is the inverse of causation. Effectual reasoning is not merely a deviation from causal reasoning. It is a distinct mode of reasoning based on an entirely separate logic than the logic behind causal reasoning. Causation models are based on a logic of prediction, i.e., *to the extent that you can predict the future, you can control it.* Effectuation, instead, is based on a logic of control, i.e., *to the extent that you can control the future, you do not need to predict it.*

Causal reasoning is useful in domains where the future is predictable, goals are known, and an exogenous environment serves as the ultimate selection mechanism. But it does not provide useful criteria for action in domains where these three characteristics are absent – namely, in problem spaces characterized by Knightian uncertainty (Knight, 1921), Marchian goal ambiguity (March, 1982) and Weickian enactment (Weick, 1979). The absence of markets problem in entrepreneurship, alluded to in the beginning of this paper, can be more generally modeled as the problem of making decisions in the absence of a predictable future, clearly known goals and an independent environment. It is in precisely such problem spaces that effectuation provides principles, techniques and criteria for action. Effectual reasoning, therefore, *integrates* the Knightian, Marchian, and Weickian problem spaces and develops techniques that provide a new, but theoretically fully funded alternative to causal reasoning. For a detailed description of the two modes of reasoning and their differential application to problems in entrepreneurship see Sarasvathy (2001), as well as later sections in the current paper, where we induce the detailed process model from qualitative analysis of the expert protocols.

A simple example should begin to clarify and distinguish between the two types of processes. Imagine a chef assigned the task of cooking dinner. There are two ways the task could be organized. The first case would be where the host or client has picked out a menu in advance. All the chef needs to do is to list the ingredients needed, shop for them and then actually cook the meal. This is a process of causation. It starts with a given menu and focuses on selecting between effective ways to prepare the meal.

The second case would be when the host asks the chef to look through the cupboards in the kitchen for possible ingredients and utensils, and cook a meal. Here, the chef has to imagine possible menus based on the given ingredients and utensils, select one, and then prepare the meal. This is a process of effectuation. It starts with given ingredients and utensils, and focuses on preparing one of many possible desirable meals with them.

To extend this overly simple example to business, imagine the manufacture of a product. In the case of causal reasoning, the blueprints of the product are provided in advance, together with its costs, and estimates of market demand; the manufacturer needs simply to procure the raw materials and process and assemble them according to the predetermined plan. In the case of effectuation, the manufacturer has a general idea that *might* lead to a product that *could* be marketed profitably. Gillette was looking for something customers would have to purchase repeatedly (McKibben, 1998). While he was shaving one morning, it occurred to him that a non-permanent razor might fit his specification. He then had to develop a cheap, effective removable-blade razor, generate an adequate initial market, and so on, always modifying his plans as he gained new knowledge and new stakeholders from his initial efforts.

Studies of Expertise – and Their Usefulness for Understanding Effectual Reasoning

Expertise in any area entails certain common cognitive processes among the experts who solve problems within the given area (Chi, Glaser et al. 1982). The extraction of these processes has been the central goal of hundreds of protocol analysis studies in the past 30 to 40 years. Some examples from business include: Decision making (Montgomery & Svenson, 1989); Accounting (Belkaoui, 1989); Argumentation in management consulting (Young 1989); and Software cost estimation (Mukhopadhyay, Vicinanza, & Prietula, 1992). Protocol analysis has also been used extensively in studying decision making processes of experts in areas other than business, such as chess (Charness 1989), medical diagnosis (Johnson et. al., 1981), mathematics (Webb, 1975), and scientific discovery (Qin, & Simon, 1990).

In a detailed investigation into conceptual and methodological issues involving verbal protocols, Ericsson and Simon (1993) provide examples from over two hundred empirical studies that use protocol analysis. They emphasize the advantages of using *think aloud* protocols over other methods, particularly methods calling for retrospective recall such as interviews or pure stimulus-response methods such as questionnaires. Think-aloud protocols call for *concurrent* verbalization – i.e., subjects are required to think aloud continuously *as* they solve the problems. The transcriptions of their taped verbalization form the basic data to be analyzed. The essential logic behind the use of protocol analysis, widely accepted by the researchers who use it, can be summarized as follows: While retrospective recall allows the subject to make up good stories about how they believe they solve problems, and stimulus-response methods force us to *deduce* subjects' decision processes after the fact, concurrent verbalization allows the researcher to look directly inside the black box of cognitive processing, because of the structure of the short term memory system of the human brain (Ericsson & Simon, 1980).

Protocol analysis has been used successfully in management to separate expert managers from novices in their problem solving (Isenberg, 1986) and in entrepreneurship to differentiate entrepreneurs from bankers in how they manage risks (Sarasvathy, Simon, & Lave, 1998). In the current study, entrepreneurial expertise is embodied in the entrepreneurial process. Prior researchers have categorized several tasks associated with this process such as: locating a business opportunity; accumulating resources; marketing new products; producing the product; building an organization; and responding to government and society (Gartner, 1985). Each task involves uncertainties including those due to non-existent markets. Making decisions in the face of such uncertainties, therefore, constitutes the main content of entrepreneurial expertise.

Entrepreneurial expertise and decision-making under uncertainty

Historically, the research on decision-making under uncertainty can be divided into (a) the normative development of rational decision models (MacCrimmon, Wehrung, & Stanbury, 1986) and (b) empirical investigations into bounds on that rationality in actual decision makers (Kahneman & Tversky, 1990).

The normative development is rooted in the conceptual distinction between "risk" and "uncertainty" (Knight, 1921). The commonly used statistical metaphor of the urn containing different colored balls serves to illustrate the difference between the two (Kamien, 1994). Problems involving risk are akin to a speculative game with an urn containing 5 green balls and 5 red balls. The drawer of a red ball is awarded a prize of $50. For any given draw, we can precisely calculate the probability of getting a red ball, because we know the underlying distribution of balls inside the urn from which we are making the draw. Problems involving uncertainty involve the same award of $50 for the draw of a red ball -- except this time we do not know how many balls are in the urn, of which colors, or even if there are any red balls at all in the distribution. In statistical terminology, decisions involving the first type of urn with the known distribution call for classical analytical techniques; and the decisions involving the second type of urn with the unknown distribution call for estimation techniques. Once the underlying distribution is discovered through estimation procedures, the urn with the unknown distribution is transformed, as it were, into the urn with the known distribution and becomes susceptible to analytical techniques.

Real life examples of *risk* include all types of insurance, some areas of the stock markets, and gaming of various types. Forecasting demand for very well established products such as Coca Cola or personal computers nowadays also fall within this category. Some real life examples of *uncertainty* include dealing with environmental pollution, global warming, genetic cloning, and commercialization of innovations, particularly radical innovations.

Experiments by researchers developing normative models have demonstrated that human beings in general prefer the “risky or known distribution” urn over the “uncertain or unknown distribution” urn (Ellsberg, 1961). But entrepreneurship researchers have speculated that since entrepreneurs have been shown to have a high tolerance for ambiguity, they would have a preference for the urn with the unknown distribution (Kamien, 1994).

Both normative approaches have been qualified by researchers who have shown that human beings in general are not strictly rational (Simon, 1959). Instead, their rationality is bounded by cognitive limitations such as physiological constraints on computational capacity (Payne, Bettman, & Johnson, 1993); and psychological limitations such as biases and fallacies (Bar-Hillel, 1980; Tversky & Kahneman, 1982). Yet this does not imply that decision makers are irrational. Rather, the evidence suggests that within certain bounds, decision makers use heuristics that often lead to very effective decisions (Gigerenzer, Hell, & Blank, 1988).

The arguments from both perspectives – rationality and bounded rationality – can be summarized as follows. If the decision makers believe they are dealing with a measurable or relatively predictable future, they will tend to systematically gather information and invest some effort on a reasonable analysis of that information, within certain bounds. Similarly, if they believe they are dealing with relatively unpredictable phenomena, they will try to gather information through experimental and iterative learning techniques aimed at first discovering the underlying distribution of the future.

The concept of effectuation suggests a rather different logic for the choice process: "Whatever the initial distribution of balls in the urn, I will continue to acquire red balls and put them in the urn. I will look for other people who own red balls and induce them to become partners and put their balls in the urn. As time goes by, there will be so many red balls in the urn that almost every draw will obtain one. On the other hand, if I and my acquaintances have only green balls, we will put them in the urn, and when there are enough, will create a new game where green balls win." Of course, such a view may express hopes rather than realities, and many entrepreneurs in the real world do fail. This fact does not negate the hypothesis that they are often more concerned with molding, or even creating, the part of the world with which they are concerned than with predicting it and reacting to the prediction.

For the purposes of this study, the first approach– i.e., decision models dealing with the "known distribution" -- is called ANL (for analytical approaches). ANL includes traditional market research techniques such as focus groups and questionnaires and/or hiring professionals to study the market and come up with decision alternatives. The second – i.e., decision models dealing with the "unknown distribution" – is deemed BAN (for Bayesian approaches – "Bayesian" stands for all types of statistical estimation using iterative discovery procedures). BAN primarily includes test marketing, trial ballooning and other systematic techniques of experimentation and iterative learning aimed at discovering the structure and shape of the potential market.

At their logical core, both ANL and BAN are causation models. They require the decision maker to start with a pre-defined potential market and seek information about it using two different categories of approaches – analytical (ANL) and estimation (BAN). In contrast, effectuation, referred to as EFF for hypothesis testing, incorporates the logic of control, and involves attempts to shape and *create* the potential market rather than divine it through analytical or estimation techniques. EFF includes statements not only attesting to subjects' ability and desire to shape the environment through commitments from key stakeholders, but also codifies explicit comments rejecting techniques of ANL and BAN.

The central hypothesis for the first stage of data analysis can now be stated as:

Hypothesis: When faced with creating a firm that markets a new product, expert entrepreneurs, as opposed to novice MBA students, prefer effectuation (EFF) to the two types of traditional market research techniques involving analysis (ANL) and estimation (BAN).

METHOD

First, entrepreneurial expertise was operationalized as a set of criteria for sample selection. Second, a research instrument was developed to capture the information seeking tasks involved in discovering and/or creating the market for a new product. Third, a comparison sample of novices was selected. Fourth, subjects completed the think aloud task and their concurrent verbal protocols were collected. Coding and analysis of the protocols proceeded in two stages. In the first stage, the hypothesis was tested and the existence of effectual reasoning in expert protocols and relative non-existence among MBA students established. In the second, a process model of effectuation contained in the expert protocols was inductively extracted and contrasted with causal models widely used in the MBA curriculum.

Subjects

Current literature on expertise distinguishes experts using a construct called "Deliberate practice" (Ericsson and Lehmann 1996). Exceptionally high task performance is consistently associated with experts as they solve complex problems in their domain more quickly, more easily, and more accurately than novices (Simon and Simon 1978; Larkin, McDermott et al. 1980; Charness, Reingold et al. 2001). But experience alone is not sufficient for expertise. The systematic differences between experts and novice individuals within a domain nearly always reflect attributes acquired by experts during their lengthy period of deliberate practice (Ericsson and Lehmann 1996). This literature has established that deliberate practice takes time. Over three decades of research in the area has converged on the original "10-year rule" that Simon and Chase (1973) posited. While not hard and fast, the rule suggests that it takes a minimum of 10 years of deliberate practice for a novice to ascend to the rank of expert.

For the purposes of this study, an expert entrepreneur is defined as a person who, either as an individual or as part of a team, has founded one or more companies, remained with at least one company they founded for more than ten years, and had taken it public. The public company requirement not only satisfies a very stringent definition of entrepreneurial expertise, but also provides additional data about the actual experience of the subjects in the form of annual reports, press kits etc.

Two sources were utilized to identify possible expert entrepreneurs for the study: (1) A list of the one hundred most successful entrepreneurs from 1960 to 1985, compiled by the venture capitalist, David Silver (Silver, 1985); and, (2) The list of national winners of the Entrepreneurs of the Year awards, compiled by Ernst & Young. Together, the two sources drew their members from a pool that included virtually every enduring company created by an entrepreneur in the US from 1960 until 1996. As clearly outlined in their publications, both sources used several evaluation procedures and qualification criteria to select their lists from the complete populations of entrepreneurial companies in their respective times. Thus the sample for this study was drawn indirectly from the complete population of entrepreneurs at large, and directly from a complete population of *expert* entrepreneurs.

The characteristics of the final pool of expert entrepreneurs suggest the sample is fairly representative of the population of expert entrepreneurs. Subjects from 17 states across the U.S. were all male, 90% American, aged between 40 and 82, with two thirds having graduate degrees. While all subjects were male, there is no reason to believe that it would make the sample less representative since the percentage of female entrepreneurs who fulfilled the necessary criteria in the original population was less than one half of 1% to begin with. On average subjects had founded seven new ventures, with the minimum number being three. Besides founding a company, actively running it, and taking it public, the subjects have a variety of entrepreneurial experiences including multiple ventures, failures both before and after their successes, mergers and acquisitions, major PR coups and disasters, taking a public company private, etc. The companies they built range in annual sales from $200 Million to $6.5 Billion. The companies also span a very wide range of industry groups, including retail goods and services, household products such as teddy bears, ice cream and razors, security services, contract programming, computers, software, telecommunications, media, biotechnology, environmental technologies, steel, railroads, power plants, and more.

Protocols were collected from 27 experts and 37 novices. Based on precedents in the "deliberate practice" literature on expertise, we sought a control group of novices who would have enough experience in basic business knowledge so as to understand and tackle the problems in the research instrument, yet could be starkly contrasted with the experts in terms of their entrepreneurial experience. We chose 37 graduate students in business administration. The subjects in the novice group were 97% American, aged between 26 and 46, with primary experience in managerial roles in large and complex organizations. Their backgrounds spanned a wide range of occupations, including pilots, acquisitions, supply and logistics, manpower recruitment and management, operations and maintenance, and medical services. Comparing this novice group with the expert entrepreneurs on key indicators of entrepreneurial expertise showed that the groups were dichotomous. 87% of the MBA students had never founded a firm and, of those that had, only one had started multiple ventures (in that case, two).

Using a sample of MBA students as the novice (control) group in this study raises two issues. First, what makes these subjects novice entrepreneurs and not novice managers, novice doctors or novice chess players? And, second, might a better sample of novice entrepreneurs exist? To the first question, while there is no doubt that MBA students are also novice managers and perhaps even novice doctors or chess players, that does not preclude them from being considered novice entrepreneurs. In fact, MBA students are as likely as any other group of individuals, if not more likely, to pursue an entrepreneurial career. Furthermore, there is an established tradition of using students in expertise experiments in spite of the fact that their “novice-ness” may extend to dimensions not of interest to the study (Lehmann and Norman 2005, Andersson 2004). For example, Isenberg (1986) used 12 general managers and 3 college undergraduates in a think-aloud protocol study to develop and test a model of managerial decision making. This view is generalized by researchers in the discipline of psychology where novices are defined as people who have not experienced the 10-year process of deliberate practice involved in becoming expert (Simon and Chase 1973).

Addressing the second question, using MBA students as the novice sample in this study provides the advantage that it allows us to ensure a common baseline of knowledge in business fundamentals. Without a comparable knowledge across both our novice and expert samples, the findings from the business specific task used in our protocol might be confounded simply by lack of familiarity with business in general. For example, a sample of people with a stated desire to become an entrepreneur, or even with a small amount of entrepreneurial experience, might also be an effective novice sample. However, a random sample of these would likely provide two sources of variation – one from the lack of basic business knowledge and another from the lack of entrepreneurial experience. In selecting the novice sample we weighed the costs and benefits of the two sources of variation and found that the benefits of comparability across basic business knowledge outweighed any costs due to the stark contrasts in entrepreneurial experience – in fact, we found the latter to be of added value than a cost to the experimental choice. This is especially important because our findings in this particular study do not hinge on interest and/or genuine intention to start the business in the protocol, but around the knowledge base that drives the steps and processes of starting and operating that business.

Both during the experiment and afterwards, several subjects – both expert entrepreneurs and MBA students - mentioned they found the problems interesting, realistic and absorbing. Several experts commented that the problems reminded them of actual decisions they had to make in their real life entrepreneurial experience.

The Research Instrument

Subjects were given a detailed description of an imaginary product called *Venturing*. Since the expert sample varied (intentionally) in all aspects except entrepreneurial expertise, the decision problem used in the study had to be chosen so as not to technologically or otherwise bias some subjects against others. Therefore entrepreneurship itself was made the product for which the subjects had to identify/create a market. *Venturing*, as described fully in Appendix 1, is an imaginary game of entrepreneurship. Based on the description, subjects were asked to answer the following five questions:

1. Who could be your potential customers for this product?
2. Who could be your potential competitors for this product?
3. What information would you seek about potential customers and competitors - list questions you would want answered.
4. How will you find out this information - what kind of market research would you do?
5. What do you think are the growth possibilities for this company?

Protocols from Question 4, hereafter called the MR (Market Research) question, were used to test the central hypothesis. Thereafter, protocols from all the questions were analyzed to develop the grounded process of effectuation that the subjects used.

DATA ANALYSIS 1: QUANTITIATIVE TESTS OF THE HYPOTHESIS

Coding

First, the protocols from the MR question were read several times to identify relevant semantic chunks for coding. The semantic chunk is the primary unit of analysis for hypothesis testing. A semantic chunk can range from a single phrase or sentence to a string of sentences that hang together to make a single meaningful point about the decision at hand. Second, the chunks were coded by the authors and external coders. The external coders did not participate in the study in any way except for this particular task, and were unaware of the hypothesis. The semantic chunks were coded based on a coding scheme segregating them into three main categories ANL, BAN and EFF -- developed especially to test the hypothesis in the study. Coded chunks are quoted throughout the ensuing text. Experts are numbered E1 to E30 and novices are numbered N1 to N37. These numbers are parenthesized at the end of each quoted chunk for the reader's convenience.

ANL included statements suggesting the use of traditional market research methods such as focus groups and surveys and/or hiring professionals to conduct such market research. Examples of semantic chunks coded ANL include: "I would also go to the market-- like 4 or 5 market research companies to find out whether they had done any research in this area." [E8]; "It's easy to hire a research company, I think. Outsource that. Yeah, because that will probably take a lot of time. I mean, to find kids, you'd have to walk the malls and walk the schools, or whatever. To find home-based people, you'd have to probably knock on doors. Not very exciting. To find professionals, just getting time from them would probably be very challenging. I would think outsourcing would probably be a good idea" [N27]; "I would want to do some market research relative to who I think my core customer groups are and what percentage are more likely to buy." [E28]

BAN included statements suggesting the use of systematic iterative learning methods such as test marketing and trial ballooning. Examples of semantic chunks coded BAN include: "As far as the school boards, that would be a much more involved and difficult research project and almost seat of the pants." [E23]; "I'd probably do some test marketing." [E7]; "Or you try it on a kind of trial and error basis. If you see it works, it comes back to you and you change it before you officially launch it." [N24]. Examples of semantic chunks coded as EFF are used throughout the section titled "Data Analysis 2".

Tests of the Hypothesis

Of the total of 306 semantic chunks used for hypothesis testing, 71 (23%) were coded ANL, 48 (16%) were coded BAN and 187 (61%) were EFF. The external coders found 13 of the 306 chunks not applicable to the question under consideration, i.e., the way the subjects would do market research. Four of these pertained to one subject, E10. A total of 40 mismatches were found between coders, included the 13 disputed chunks mentioned above. Inter-coder reliability was calculated at 94% (James et al, 1993).

Insert Table 1 about here

Comparing the expert entrepreneurs and MBA students, experts used EFF in their cognitive processes 75% of the time, whereas the students used EFF 16% of the time. Almost two-thirds (66%) of semantic chunks coded for the novices were ANL, compared to 10% ANL for experts. There was no significant difference between experts (15%) and novices (16%) in their use of BAN reasoning.

We used ANOVA to compare the differences between the expert and student groups. For our analyses, we calculated three percentages for each subject; causal chunks as a percent of total, Bayesian chunks as a percentage of total, and effectual chunks as a percentage of total. We then compared experts and novices in their use of the three types of thoughts. Novices demonstrated an overwhelming use of analytical thoughts, ($F = 49.10$, $p < .001$), experts demonstrated an overwhelming use of effectual thoughts ($F = 55.45$, $p < .001$), and there was no significant difference between the groups in their use of Bayesian thoughts ($F = .02$, $p = .89$).

Because we had 27 experts and 37 novices in our data set, and one of the assumptions inherent to ANOVA is that of balanced group sizes, we conducted three additional analyses, each using a different strategy for eliminating approximately 10 novice subjects, to test the robustness of our results. In the first, we eliminated the 11 subjects from the novice group who had experience in a small firm, had new venture experience, or had started a new venture. Our results were unchanged. In the second, we eliminated the 10 oldest subjects in the novice group from the complete data set, and again our results were unchanged. For completeness, we eliminated, the 10 youngest subjects in the novice group from the complete data set, and our results were still unchanged.

For additional rigor, a second test of the hypothesis was conducted. Given the fact that different subjects had a different total number of semantic chunks, this test examined whether the more loquacious subjects were skewing the numbers in favor of the hypothesis. We employed a method called the Borda count from the social choice literature (Saari, 1994). For each subject, the absolute numbers of chunks in the three categories were converted into relative magnitudes of 0s, 1s and 2s. This is a very conservative measure, for if a subject such as E21 made no statement pertaining to ANL, 1 statement pertaining to BAN and 9 statements of EFF, his Borda count would be 0 for ANL, 1 for BAN and *only 2* (instead of 9) for EFF.

The total Borda count for the experts came to 21 ANL; 23 BAN; and 49 EFF. This means that even after removing the slightest possibility of relative loquacity there is an overwhelming preponderance of EFF statements – more than twice over ANL and BAN. Among novices there is an overwhelming preponderance of ANL statements: 40 ANL, 12 BAN and 10 EFF. This means novices made four times more ANL statements than EFF and three times more ANL statements than BNL. These results establish provisional acceptance of the hypothesis that in creating the market for a new product expert entrepreneurs show a clear preference for effectuation, whereas MBA students, as expected, prefer traditional market research methods. In fact, more than 63% of all the statements made by 74% of the expert entrepreneurs (20 out of 27) were statements of effectuation; *7 of the 27 experts did not make any statements other than EFF*.

DATA ANALYSIS 2: DEVELOPING A PROCESS MODEL OF EFFECTUATION

Having discovered that all but 4 of the 27 expert entrepreneurs did not use causal reasoning to any meaningful extent, the focus of the analysis shifted to the task of identifying the specific process model of effectuation the 23 expert entrepreneurs used. The contents of the protocols were analyzed using simple process tracing methods, such as those developed and employed by researchers in cognitive science as a preliminary step to writing expert systems (Haines, 1974). This qualitative content analysis involved two stages. In Stage 1 of the qualitative analysis, the coded chunks from the MR question were revisited, listing specific suggestions made by the subjects in lieu of using causal reasoning, grouping similar suggestions together into common categories and identifying and counting repeating patterns in the suggestions. A similar approach was used in Stage 2 of the qualitative analysis, except transcriptions from all five questions were analyzed, with the added initial step of first identifying all relevant semantic chunks pertaining to identifying the market for *Venturing*.

Two independent researchers, not including the external coder for the Market Research question, participated in developing the frequency counts used in this analysis. In the ensuing sections describing the results of the analyses, a large number of original quotes from the experts' protocols are presented in support of each frequency count used. These quotes not only support the emerging decision model discovered in the data, but also reinforce the high reliability (over 90%) between the researchers.

Exactly as suggested by the model of effectual reasoning, the experts started their decision-making process with a given set of means, rather than a pre-determined goal

(Stage i). Three categories of "means" emerged from the data. Experts selected their first "customer" based on any one or a combination of the three categories: (1) Who they (the subjects) were; (2) What they knew; and (3) Whom they knew. Initial customer selection based on who the subjects were included statements such as: "I'd rather sell to corporate America because I don't like schools" [E22]; "I'd rather be in the education business than in the game business" [E2]; and "I am intrigued by games, I really am, I think it is an exciting area" [E3]. The second category of "what they knew" had two sources for initial customer selection. Subjects in this category either used their previous work experience or an analogy of something they had experienced in one way or another. Five experts used other games (such as Monopoly, Mousetrap, Sim City, Civilization, etc.) as analogies and talked about either themselves or their kids enjoying computer games, and so making kids or well-to-do adults the first customers. Three had direct experience selling other types of toys and games or had been involved in educational software startups as potential investors. Under the third category of "whom they know", experts often selected a strategic partner as their first customer. Six experts selected a business school professor they knew as their first customer. Even some of the subjects who selected their first customer from the earlier two categories suggested making strategic partners of the first few. For example, E26, quoted earlier said, "Traditional market research says, you do very broad based information gathering, possibly using mailings. I wouldn't do that. I would literally, target, as I said initially, key companies who I would call flagship, do a frontal lobotomy on them…. The challenge then is really to pick your partners, and package yourself early on before you have to put a lot of capital out."

Converting initial customers into strategic partners was the most popular method of developing a customer/segment definition (Stage ii). Another strongly preferred method was to talk directly and *sell* to customers/strategic partners at a very early stage. Seven experts suggested selling even before the product was developed or produced. For example, E1 said, "Somebody once told me the only thing you need is a customer and I think I'd start by just... going... instead of asking all the questions I'd go and say.. try and make some sale. I'd make some… just judgments about where I was going -- get me and my buddies -- or I would go out and start selling. I'd learn a lot you know.. which people.. what were the obstacles.. what were the questions.. which prices work better and just DO it. Just try to take it out and sell it. Even before I have the machine. I'd just go try to sell it. Even before I started production. So my market research would actually be hands on actual selling. Hard work, but I think much better than trying to do market research". E4 said, "Every product that potential customers are using, when critically examined, might give you insight on one aspect of your particular product. So you don't have to yourself go and do massive experiments. You can actually, by looking at half a dozen different products, you might actually learn about customer behavior, their need and their aspiration and.. dynamics. So, without even going and building a product, you might want to get some understanding of the dynamics of that particular market that you're.. since it doesn't exist, that's the best you can do".

The process for moving from a single customer or strategic partner to a market consisted of two additional stages: (iii) Adding segments either through the development of additional products for the initial segment or through strategic partnerships; and, (iv)

Defining a market through a strategic vision for the company. One particular protocol (that of E5 from question 5) is presented in Appendix 2 in its entirety since it illustrates these last two stages spectacularly. Table 2 contains the process tracing based on this protocol. The process tracing is used along with data from question 1 and 4 to synthesize the complete process of effectuation used by E5.

Insert Table 2 about here

E5 selected his initial *customer* through his previous experience. He had recently published a book and selected potential entrepreneurs or students of entrepreneurship, the audience for his book, as his first customers. Then, in question 4, he suggested understanding his first customer by going to his publisher -- "So the places I would go would be the first rocks I would turn over and I would undoubtedly find leads within leads in the places that I talked about." If he were not in such a position, he would, he said, "…try to find a mentor who had written a successful business book, convince the mentor that this is a great product and get in that way."

Having thus identified a customer and defined a target customer segment in terms of current readers of books on entrepreneurship, he began question 5 by stating he did not believe this product had great market potential. But he proceeded to consider abstract aspects of both the product and the initial customer segment, defining both tentatively in terms of a theoretical single market as *any learning in an interactive situation where simulation is a benefit*. Gradually thereafter, adding new segments in an iterative process of refining and re-formulating his original definitions, he ended up *creating* a market (or more precisely, in this experiment, the vision of a market) defined as *any organization in a learning situation with technical requirements* from which, in his own words "…you could see a several hundred million dollar company coming from it." Other experts used other words but the pattern was repeated. For example, E8 said, "It's sort of like driving a car down the street. You never point the car and just hang on to the wheel without moving it. As the car moves along you have to adjust the steering wheel to keep it going even in the straight direction."

Comparing the Process Followed by MBA students

After finding that novices had a strong preference for a causal mode of reasoning (78% of novices made no EFF statements at all) we also conducted a qualitative data analysis of the causal reasoning process followed by novices. The first striking pattern in novices' decision-making processes was the considerable faith they placed in the efficacy of market research. Novices made statements such as: "If your market research and your survey shows that there is a benefit, then I think there is no reason why schools wouldn't use this as a teaching tool for something as part of their curriculum" (N35); "[Y]ou would want to do some kind of market research. You don't want to go out there unknowing. You need to have something to work with" (N10) and; "I think once you get the market research down and you find out what's actually out there between your competitors and what the customers want, I think there is some possibility." (N18). The unquestioned assumption that market research was appropriate to the scenario stood in sharp contrast with expert entrepreneurs who largely rejected traditional market research in their decision process, making comments such as: "I mean… I don't believe in market research actually"

(E1) and; “You can’t go out and survey customers and say, o.k. what kinda car do you really want? and so forth” (E7).

Novices then proceeded to enumerate several alternative market research methods they would use. There were three frequently mentioned methods, each of which is commonly found in marketing textbooks (Kotler 1991). The first was Internet and other public sources of information. The MBA students made comments such as: “I’d get on the Internet and Google about everything” (N15); “I would try to find out as much as I could on my own through the Internet or research materials, publications, current publications, periodicals” (N23) and; “What kind of market research would you do? Google is a good one” (N11). The second research method was surveys. N36 said that, “I would probably want to develop a type of survey that I could have people actually write down their answers, so that I can evaluate it”. N11 said, “Questionnaire. Maybe online survey… [I]f it is an online survey, I know that the people who answer that will already be computer savvy, Internet aware.” A third frequently favored market research method was focus groups, drawing comments such as, “I guess just focus groups. Show people the game if it’s available. If it’s not available, tell them about it and see what they think of the idea” (N17) and; “You could… focus groups for different… you could bring in different kinds of customers… just bring them in and ask them what they would be looking for if they had a program like this” (N34).

The process followed by the MBA students was vividly illustrated by N19, whose protocol for question 4 of the problem set is presented in Table 3. N19 starts by saying he would want to know about existing markets (“*the markets*”) and competitors in those markets, without hesitating for a moment to consider whether a market for venturing pre-exists. Then he addresses the universe of all theoretically possible customers, referring to "potential customers who'd be interested in the product anywhere?" and saying that he would "Think of all the potential markets out there", which is the common starting point recommended in marketing textbooks (Kotler, 1991). He mentions a rudimentary segmentation of the assumed market and turns to the Internet as a means of gathering data on these segments. The process trace finishes with the admonition that for the *Venturing* product "[Y]ou could just market the hell out of it and it doesn't really have to be all that good." At no point does N19 actually define initial target customers, or talk about how he will reach them and get them to buy. This pattern is repeated in other novice protocols. The result was typically a free-floating analysis of a theoretical market, which stood in sharp contrast with the concrete way the expert entrepreneurs said they would build a wide variety of specific markets for *Venturing.*

Insert Table 3 about here

Putting It All Together: Causation and Effectuation

When put together as a process model, it became increasingly clear that the process emerging out of the expert data was an inversion of the causal reasoning we teach students in entrepreneurship classes. Figure 1 graphically contrasts the effectuation process with the Segmentation-Targeting-Positioning process, clearly illustrating the reversal of the causal direction.

Insert Figure 1 about here

In this model, the decision maker does not start with a pre-determined effect or a pre-defined market to be created. Instead the process begins with identifying a set of possible causes as given (who the decision maker is, what he/she knows and whom he/she knows), and proceeds to choose between several possible effects in a contingent manner, taking advantage of new opportunities as they arise. The evidence shows effectuation is intrinsically *path-dependent* and *contingent* rather than *goal-driven* and *planned*.

A comparison of the different stages of effectuation identified in the data with the stages involved in the textbook marketing model of Segmentation-Targeting-Positioning illustrates the causal inversion at the core of effectuation. In the textbook version, the process starts with a pre-defined market consisting of all possible customers for the product (Kotler, 1991). Information is gathered about this pre-defined market using techniques such as focus groups, surveys, etc. The market is then divided up into segments using relevant segmentation variables. Thereafter, based on an evaluation of their potential for achievable market shares, one or a few particular segments are selected and targeted. Finally, the product is positioned within the target segment/s in an optimal manner subject to resource and technological constraints.

A decision maker who uses the textbook model to create a market for *Venturing* would begin with a universe of all possible customers (just as N19 did). This market would therefore be defined as all people who are computer literate and interested in either computer games, learning about entrepreneurship or both. This pre-defined market would then be segmented based on variables such as age, spending power, previous purchases of computer games and/or entrepreneurship education, geographical location etc. Information would be gathered about each of these segments and some evaluation criteria would be developed based on size, growth potential, risk-return profile etc. One or more segments would then be selected as target segments with a view to maximizing potential return. Marketing strategies including distribution, pricing and promotion would be crafted and *Venturing* would be carefully positioned to capture the hearts and pockets of the individual customers in the target segment. *None of the expert entrepreneurs in this study, including the four who suggested using traditional market research techniques, actually used this top-down causal model for creating the market for Venturing.*

DISCUSSION

This paper set out to empirically establish the existence of effectual reasoning in entrepreneurial expertise as compared with students taught on current MBA curricula, as well as to suggest bounds between causation and effectuation in how expert entrepreneurs bring into existence future products and firms in the absence of current markets for them. The evidence gathered here provides strong support for the hypothesis that expert entrepreneurs have a preference for using effectual reasoning in creating markets for new products. In fact, over 63% of experts used effectuation more than 75% of the time. By comparison, 78% of the MBA students did not use effectuation at all. Furthermore, starting with the exact same imaginary product Venturing, the effectual reasoning used by experts led them to build 18 different companies, several of which involved completely disparate industries. Independent evidence suggests this phenomenon is not peculiar to this study, and that it occurs in the real world: one study of a single MIT invention showed how eight entrepreneurs developed eight different companies based on their prior knowledge and experience, rather than competing within the same pre-determined market, as causal logic would predict (Shane, 2000).

It is important to note expert entrepreneurs did not use effectuation processes across the board, and some MBA students did use effectuation to a limited extent. In addition, both experts and novices suggested using test-marketing approaches to some degree, a decision model we term Bayesian (BAN). Furthermore, independent evidence shows expert entrepreneurs recognize that once the market has been created, a more traditional and causal decision model is both useful and necessary (Sarasvathy et. al., 1998). In fact, experts expressed lucid notions on the differences between an "entrepreneurial" decision context and a "managerial" one. There is also evidence that a large proportion of successful founders of new ventures do not survive through the full growth cycle leading to an enduring firm with sustainable market leadership. For example, approximately 50% of founding entrepreneurs in venture capital backed firms are fired before the firm reaches a successful exit. Discovering and investigating the details of this transition point from entrepreneurship-driven organization to the birth of a strategic management-driven organization suggests important areas for future research.

A second potentially fruitful area for further research might address to what extent effectuation is a trait and to what extent it is a direct result of entrepreneurial experience and expertise development. We use the term "trait" here to mean a medium-term constant attribute of a person – some aspect of ability or behavior that remains stable over time. As a result of conversations with psychologists, we have come to acknowledge that there may be a traits aspect to effectuation. In other words, there may be some human beings who are naturally better at or prefer the use of this logic. But the data also suggest that as a group, expert entrepreneurs have *learned* to prefer an effectual logic for actions in the early stages of firm formation. This is based on the observation that experts overwhelmingly preferred effectuation to causal approaches in the Venturing problem, though they were equally capable of using a causal logic.

A third and final potentially fruitful area of further research would be to develop and test the implications of effectuation for new venture success and failure. Explaining new venture success/failure has been one of the holy grails of entrepreneurship research. It is necessary, therefore, to consider what implications this study has for that question. We attempt below a brief outline of possible theorization in this regard.

The essence of effectuation is the use of non-predictive strategies including the affordable loss principle. In contrast, a causal approach involves calculating the levels of investment required to achieve certain levels of expected return and predicating actual plans and implementation on those calculations. Because entrepreneurs that use effectuation invest only what they can afford to lose, their pattern of investments mirrors the growth (shrinkage) of the firm. This means at any given point in time, should failure occur, the effectuator is likely to lose less in terms of investment than the entrepreneur who invests using a causal logic.

The corollary to this, of course, is that the effectuator may not make adequate investments in time to exploit a really large or extremely fast-growing opportunity, and therefore may lose out on the upside, either to other stakeholders or to competitors. In either case, we could speculate that effectuation may or may not reduce a firm’s probability of failure but it does reduce the costs of failure. Furthermore, the fact that each failure occurs earlier and at a lower level of investment might have some positive implications for the effectual entrepreneur. For any given level of initial investment in a new venture, the effectual entrepreneur survives longer. Lower costs of failure mean more experiments, so the effectuating entrepreneur reaps more benefits from cumulative learning. Lastly, even if we assume that only small successes are dependent on expertise whereas homeruns are drawn from a random distribution, it is plausible to suggest that the effectual entrepreneur gets to explore more opportunities than does the causal entrepreneur. In other words, effectuation gives the entrepreneur more shots at the jackpot.

In sum, this paper has established the existence and delineated the bounds of effectual reasoning in expert entrepreneurial decision making in the absence of markets for new products. While further research is required to carve out its logical structure in more detail and identify its theoretical and empirical links with performance, early speculation suggests provocative possibilities in this regard.

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TABLE 1

Descriptives of Expert and Novice Samples

Variable	Mean	s.d.	Minimum	Maximum
Expert Subjects (N = 27)				
Year of birth	1943	8.8	1918	1953
Ventures started	7.3	7.4	3	40
Years worked for those	21.6	9.3	12	43
Count of Analytical thoughts	0.9	1.1	0	4
Count of Baysian thoughts	1.3	1.7	0	6
Count of Effectual thoughts	6.5	4.7	0	20
Novice Subjects (N = 37)				
Year of birth	1970	4.9	1959	1979
Ventures started	0.2	0.4	0	2
Years worked for those	0.46	1.3	0	5
Count of Analytical thoughts	1.3	1	0	4
Count of Baysian thoughts	0.4	0.7	0	3
Count of Effectual thoughts	0.3	0.7	0	3

TABLE 2

Process Tracing for E5's protocol for question 5

Original protocol broken into semantic chunks	Codes for semantic chunks
I don't think it could ever be a huge company	Initial perception of potential
The basic concept is a business simulator.. startup simulator (After) successful launch of the first product (for potential entrepreneurs) with a big marketing sales push to penetrate as many different markets as we could..	First Customer Definition (He is referring to the first customer identified in question 1 and developed into a segment through "gut feeling" in question 4)
might have a successful second product.. For example, you could have a product which is how to succeed, prosper, grow and get promoted within a large company. How do I graduate in the top 10% of your class at Stanford, or Harvard or Yale.	Adding Segments
we're really talking about any learning in an interactive situation where simulation is a benefit.	Beginning of Market Definition
next there is negotiation.. so..there is sales.	Adding Segments Continued
So I guess you could go on and on and then you could genericize the thing to any situation which requires some sort of technical knowledge.. technical knowledge of negotiating.. technical knowledge of bio-molecules.. which also involves human organization.. people you have to deal with.. both outside the company to get them to help.. to work with them and inside the company to get them to understand what is the company's methods objectives etc.	Market Definition Continued
So an organization in a learning situation with technical requirements	Market Definition
And therefore you could see a several hundred million dollar company coming from it.	Change of mind of perceived potential

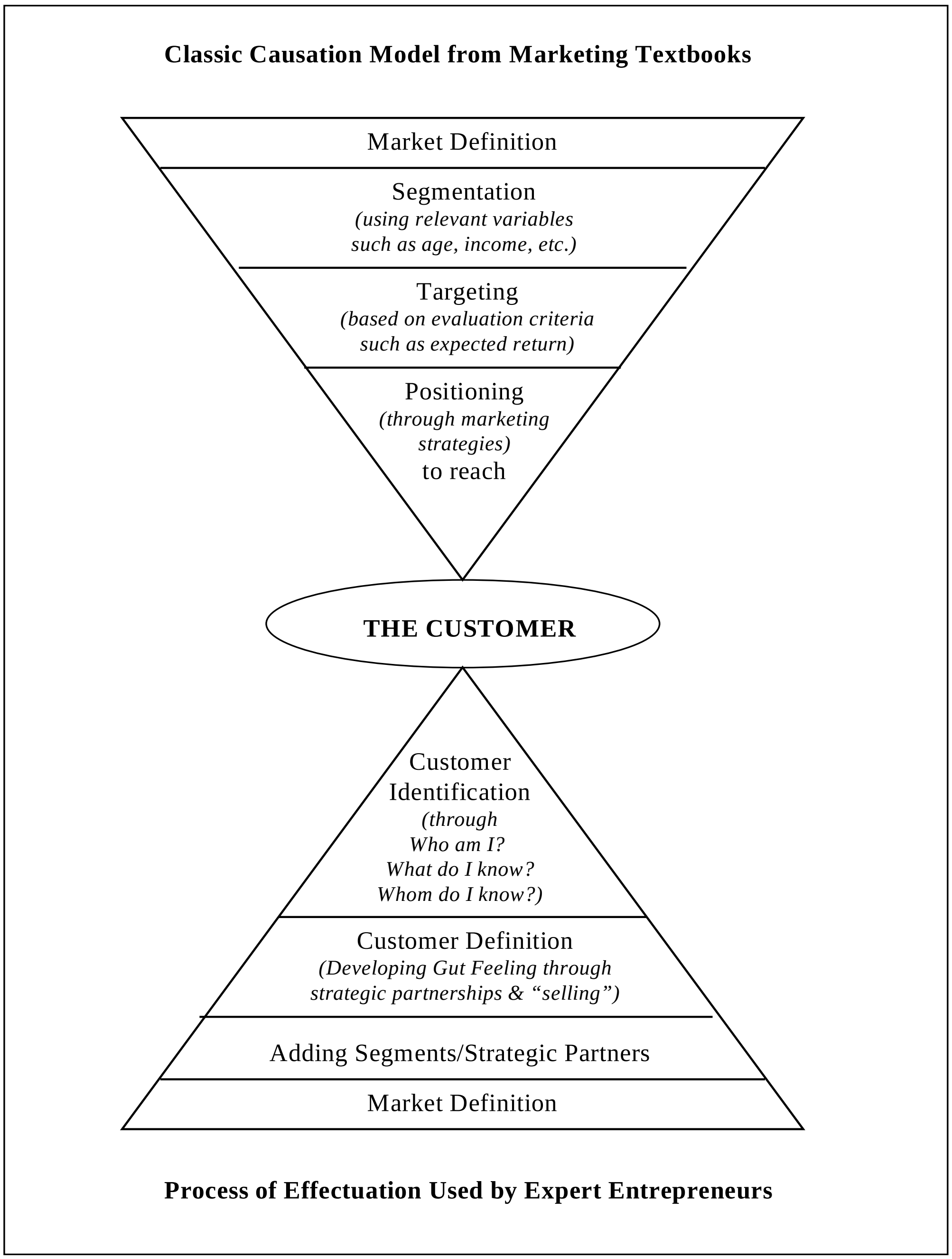
TABLE 3

Process Tracing for N19's protocol of question 4

Original protocol broken into semantic chunks	**Codes for semantic chunks**
I'd want to know about the market as far as the competitors go and find out how they're doing in the markets.	Analysis of existing markets by reference to existing competitors
How much of a market there is, potential customers who'd be interested in this product anywhere?	Market analysis, per Kotler, by starting with the universe of "potential customers who'd be interested in the product anywhere."
Think of all the potential markets out there, whether it be high school, college, people sitting around at home. …	Another reference to the universe of possible customers, and reference to a rudimentary segmentation.
To find out about this market, I'd go on the Internet first of all and look into the types of, just Google it and see what's out there. And see if there is any kind of, see what the competition is…	Method of doing market research: Internet-based data gathering to understand the nature of the market and competitors in it.
In anything academic like this - it seems academic… you're teaching people things - I would say the growth possibilities are good for the company as long as the program works… [O]r you could just market the hell out of it and it really doesn't have to be all that good.	Perception of the prospects for the firm, based on perceptions about the general prospects for the education market and reference to a general strategy of heavy marketing promotion.

FIGURE 1

Contrasting the Textbook Paradigm in Marketing with Effectuation



APPENDIX 1

Instructions to Subjects and Detailed Description of *Venturing*

Introduction

Please read aloud the following instructions and the product description. Please think aloud continuously as you solve the problems thereafter. In the following experiment, you will solve ten decision problems. These problems arise in the context of building a new company for an imaginary product. A detailed description of the product follows this introduction.

Although the product is imaginary, it is technically feasible and financially viable. The data for the problems have been obtained through realistic market research -- the kind of market research used in developing a real world business plan. So far, the entrepreneurs who participated in this study found the project both interesting and feasible.

Before you start on the product description and the problems, I do need one act of creative imagination on your part. I request you to put yourself in the role of the lead entrepreneur in building this company -- i.e., you have very little money of your own to start this company, but you have about five years relevant working experience in the area.

Description of the product:

You have created a computer game of entrepreneurship. You believe you can combine this game with some educational material and profiles of successful entrepreneurs to make an excellent teaching tool for entrepreneurship. Your inspiration for the product came from several reports in the newspapers and magazines about increasing demand for entrepreneurship education; and the fact that a curriculum involving entrepreneurship even at the junior high or high school level induces students to learn not only business-related topics but math and science and communication skills as well.

The game part of the product consists of a simulated environment for starting and running a company. There are separate sub-simulations of markets, competitors, regulators, macroeconomic factors and a random factor for "luck". The game has a sophisticated multi-media interface -- for example, a 3D office where phones ring with messages from the market, a TV that will provide macroeconomic information when switched on, and simulated managerial staff with whom the player (CEO) can consult in making decisions. At the beginning of the game, the player can choose from a variety of businesses the type of business he/she wants to start (For example: manufacturing, personal services, software etc.) and has to make decisions such as which market segment to sell to, how many people to hire, what type of financing to go for, etc. During the game, the player has to make production decisions such as how much to produce , whether to build new warehouses or negotiate with trucking companies, etc.; marketing decisions such as which channels of distribution to use, which media to advertise in and so on; management decisions involving hiring, training, promoting and firing of employees, and so on. There is an accounting subroutine that tracks and computes the implications of the various decisions for the bottom line. The simulation's responses to the player's decisions permit a range of possible final outcomes -- from bankruptcy to a "hockey stick".

You have taken all possible precautions regarding intellectual property. The name of your company is *Entrepreneurship, Inc.* The name of the product is *Venturing*.

APPENDIX 2

Original Protocol of Question 5 from E5

"This company could make a few people very rich, but it cannot.. I don't think it could ever be a huge company. The basic concept is a business simulator.. startup simulator.. so.. in the same way in a jet simulator you can hop in and fly something electronically and not blow it up.. so you can hop into a business situation and practice and get a lot of reflexes built up and thought processes built up up front. So.. a successful launch of the first product with a big marketing sales push to penetrate as many different markets as we could.. might have a successful second product. For example, you could have a product which is how to succeed, prosper, grow and get promoted within a large company. Making an equivalent product for the quote organization person as opposed to the entrepreneur would give you market of everybody with aspirations at IBM, AT&T, Exxon etc. etc. so.. That product could be a follow-on product.. the research would be similar, the product development would be similar, and so the production part would be equivalent and some of the same marketing channels would also work. You could make another product, would be, for students. How do I graduate in the top 10% of your class at Stanford, or Harvard or Yale. And there.. you could simulate the learning process in the classroom. and research traits that tend to make you successful or not. study habits that tend to make you successful or not. and.. a lot of how to be a good student is teachable. A lot. In my case for example, I took.. I read my material religiously before I went to classroom, I took rough notes in the classroom, I always sat in the front row, I always asked more questions than anybody else, to try to understand what's going on. Before the next class typically two days later, I would meticulously copy all of the notes. Comparing my classroom notes and enhancing them with reference materials in the textbook. I would copy my notes into my notebook to create a set of notes that was damn near publishable quality and then prior to.. during finals week.. prior to finals week I would reduce my entire notebook to cue cards.. index cards. And when I walked into a final, I had it dead cold and.. that's how I worked at Dartmouth for example. So there are studying habits that I'm aware of and you can do research on successful students and you could develop a profile that the.. marketing pitch of which should be.. students who graduate in the top 10% of a college class aren't just smart in an accident. They have different habits and ways of doing business that cause them to be successful and those are neither genetic nor intelligence related.. they are learnable. So there's your.. now you got a product that can.. you can sell to every student in the country. uhm.. so we talked about entrepreneur business, big business, students, so we're really talking about any learning in an interactive situation where simulation is a benefit. So you got.. next there is negotiation.. there are books on negotiators.. how to negotiate.. famous books.. here you could.. in reading a book about negotiation would be less effective than having an interactive 3D game about negotiation. So there you could practice being a good negotiator. And that would work. There's not a salesman in the United States who wouldn't buy one of those. How to sell you know so you got you know another learning situation where how you act and how you push people can can help you sell better. so.. there is sales. So I guess you could go on and on and then you could genericize the thing to any situation which requires some sort of technical knowledge.. technical knowledge of negotiating.. technical knowledge of bio-molecules.. which also involves human organization.. people you have to deal with.. both outside the company to get them to help.. to work with them and inside the company to get them to understand what is the company's methods objectives etc. So an organization in a learning situation with technical requirements. That simulation that had those traits so now you can.. I gave four five endeavors.. you can expand that so.. maybe I'm gonna change my opinion about the growth potential for the company.. The company could.. it is easy to see how within an hour you could name ten products and the ten products would address huge markets like all employees in Fortune 500 companies that.. who are rich enough to pay hundred dollars for it. So now all of a sudden you can see it's a software that could be a.. could be a hit on the scale of Lotus.. what Lotus was to the spreadsheet world. And therefore you could see a several hundred million dollar company coming from it."