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of Entrepreneurial Firms**

by

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Business Model Design and the Performance of Entrepreneurial Firms

Abstract

We develop hypotheses about the impact of business model design themes on the performance of entrepreneurial firms. The empirical results show that novelty-centered business model design matters most to the performance of entrepreneurial firms. Our analysis also points to a potential differential impact of business model design themes on performance under varying resource munificence regimes. As well, we find indications of potential diseconomies of scope in design; that is, entrepreneurs' attempts to incorporate both efficiency- and novelty-centered design elements in their business models may be counterproductive.

INTRODUCTION

One of the central functions of entrepreneurship is wealth creation (Hitt, Ireland, Camp, & Sexton, 2001). According to Knight (1921), entrepreneurs create wealth by purchasing resources at prices lower than their future value, which is uncertain at the time of purchase. Entrepreneurs are focused on the discovery and exploitation of opportunities for the creation of future goods and services (Venkatraman, 1997). In accordance with Schumpeter's (1942: 132) observation that entrepreneurship mainly "consists in getting things done," research on the entrepreneurial process has often emphasized the importance of action and implementation for the creation and exploitation of uncertain opportunities. However, recent work has begun to address the role of planning-related activities (Delmar & Shane, Forthcoming; Magretta, 2002; McGrath & Macmillan, 2000), in particular that of design-related tasks (Hargadorn & Yellowlees, 2001; Romme, 2003; Van de Ven et al., 1984) as part of the entrepreneurial process. In this paper, we build on this emerging literature to examine the impact of planned or emergent business model design on the performance of entrepreneurial firms.

The entrepreneur as a designer may focus on the product, the process, the organization, or the strategic network in which the venture is embedded. Yet, entrepreneurs are also commonly challenged to think holistically about the design of their business, that is, about the way their company intends to interact with and relate to suppliers, customers, and partners. However, relatively little is known about the implications and trade-offs of such holistic, cross-level design.ⁱⁱ One of the fundamental challenges introduced by cross-level design is the trade-off between the total value created by various transaction participants, and the value captured by a focal firm. In this article, we address this issue by focusing on the cross-level design of a firm's business model, which refers to the architecture of the transactions it enables across its boundaries in order to link factor and product markets. We develop and operationalize the business model as a distinct construct. It is a unit of analysis

that spans industry and firm boundaries and that refers to the transactions of the focal firm with external stakeholders, thereby facilitating a deeper understanding of the wealth created for all stakeholders.ⁱⁱⁱ Indeed, the received literature has increasingly recognized wealth creation as an important objective of entrepreneurial activity (Brush, Greene, & Hart, 2001; Certo, Covin, Daily, & Dalton, 2001; Hitt et al., 2001; Ireland, Hitt, Camp, & Sexton, 2001).

In this paper, we identify two critical dimensions of business model design, to which we refer as “efficiency-centered” and “novelty-centered” design themes.^{iv} Anchoring our reasoning in transaction costs theory (Williamson, 1975; 1983) and in Schumpeter’s theory of innovation (Schumpeter, 1934), we offer hypotheses about the impact of these business model design themes on the performance of the focal entrepreneurial firm, taking into consideration the moderating role of the environment. Efficiency-centered business model design aims at reducing transaction costs for *all* transaction participants, while novelty-centered business model design refers to new ways of conducting economic exchanges among various participants. These design themes are neither orthogonal (for instance, novel design elements may engender lower transaction costs), nor are they mutually exclusive: Both may be present in the design of any given business model. Moreover, the design themes are not exhaustive. Business models may be characterized by other value-creation themes. These include “lock-in,” which refers to designs that attempt to retain stakeholders, and “complementarities” which refer to designs that emphasize the bundling of goods, activities, resources or technologies. In this paper, we focus on efficiency- and novelty-centered designs in the interest of building and testing parsimonious theory about these particular designs.

Our theory links different levels of analysis by relating the total value created by the business model for its various stakeholders to the value appropriated by the focal entrepreneurial firm. To test our hypotheses, we have developed a unique data set that contains detailed information about the business models of 190 young, growth-oriented European and US firms that listed on a public exchange between 1996 and 2000. We measure

each business model design theme as a variable at one particular point in time, and we regress these variables on a range of performance measures.

Overall, we find that business model design matters to the performance of entrepreneurial firms. Our strongest and most robust finding relates to the positive association between novelty-centered business model design and firm performance. Furthermore, our analysis suggests that business model design themes may have a differential impact on performance under varying environmental conditions. Lastly, our results indicate that entrepreneurs' attempts to design both efficiency- and novelty-centered business models may be counterproductive.

The remainder of the paper is organized as follows: The next section presents our theory and hypotheses. It is followed by sections describing our data and methods and our results. We conclude with a discussion of our findings and implications of our study for future research.

THEORY AND HYPOTHESES DEVELOPMENT

One of the main challenges that entrepreneurs face in their quest for wealth creation is the identification and development of wealth-producing business opportunities; entrepreneurs strive to capture these opportunities in an uncertain environment in an effort to generate profits. To do so, entrepreneurs need to delineate the ways in which their new businesses are going to transact with and relate to suppliers, customers, and partners; in other words, they need to design their business models. As Ireland et al. note, "Firms try to find fundamentally new ways of doing business that will disrupt an industry's existing competitive rules, leading to the development of new business models" (2001: 53). Building on Amit and Zott (2001: 511), we formally define the business model as depicting "the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities."^v That is, a business model elucidates how an enterprise works with those external stakeholders with whom it engages in economic exchanges in order to create value

for all involved parties. Hence, we view the business model as a unit of analysis that centers on a focal firm but that also extends its boundaries. In this paper, we explicitly recognize business model design as a crucial task for entrepreneurs.

A business model should not be confused with competitive strategy (Magretta, 2002). Table 1 highlights the distinctiveness of these perspectives. While distinct, business model design may be strategic insofar as it differentiates a firm’s transactions with external stakeholders from those of its competitors.

INSERT TABLE 1 ABOUT HERE

The emphasis that the business model design perspective puts on the architecture of transactions is accentuated by recent advances in communication and information technologies, such as the emergence of the Internet and the rapid decline in computing and communication costs. These developments have opened new horizons for the design of transaction architectures by enabling firms to change fundamentally the way they organize and engage in economic exchanges, both within and across firm and industry boundaries (Mendelson, 2000). This seems especially applicable to entrepreneurial firms, whose performance depends on boundary-spanning organizational arrangements (Hite & Hesterly, 2001; Human & Provan, 1997).

Business Model Design Themes

Configuration theory provides a useful basis from which to derive different business model designs because it considers holistic configurations, or *gestalts*, of design elements (Miles & Snow, 1978; Mintzberg, 1979). Configurations are constellations of design elements that commonly occur together because their interdependence makes them fall into patterns (Meyer, Tsui, & Hinings, 1993). The design elements of a business model are the content, structure, and governance of transactions that allow the focal firm to pursue and exploit business opportunities. In this paper, we follow Miller’s (1996) suggestion to view configuration as a variable rather than as a deviation from an ideal type (Doty, Glick, &

Huber, 1993). Miller states that “Configuration...can be defined as the degree to which an organization’s elements are orchestrated and connected by a single theme” (1996: 509).

The relevant question then is: what are the common design themes that orchestrate and connect *a business model’s* elements? Miller (1996) mentions innovation and efficiency as possible design themes. This choice appears particularly appropriate for the study of business models adopted by entrepreneurial ventures as the two themes reflect fundamental (yet, not mutually exclusive) alternatives for entrepreneurs to create value under uncertainty. Novelty and efficiency play important roles for the emergence of new organizations because entrepreneurs can create new designs and/or reproduce and copy existing ones (Aldrich, 1999). Imitation-based approaches towards business creation are often associated with an emphasis on lower costs, i.e., increased efficiency (Zott, 2003). Since these themes are not mutually exclusive, any given business model design can be novel and efficient at the same time.

Business Model Design, Firm Performance, and the Mediating Role of the Environment

Figure 1 depicts the model that we postulate in this paper to examine the link between business model design and firm performance.

INSERT FIGURE 1 ABOUT HERE

We hypothesize that the design of a firm’s business model, centered specifically on the themes of novelty and/or efficiency, is associated with the performance of the focal firm. This association can be broken down into a primary effect, which relies on the value-creation potential of the business model design, and a secondary effect, which considers the impact of business model design on the focal firm’s ability to appropriate the value that its business model creates. The model in Figure 1 also considers the moderating role of the environment, in particular that of munificence (see Dess & Beard, 1984; Tushman & Anderson, 1986), on the relationship between design and performance. This environmental characteristic is

particularly relevant for entrepreneurial firms, which often depend on resources owned and controlled by third parties.

First, we consider the primary effect of a business model's design themes on the performance of the focal firm. Business models can create value by enhancing the customers' willingness to pay or by decreasing suppliers' and partners' opportunity costs through improved transaction efficiency. The total value created by a business model is the upper limit for the value captured by the focal firm (Brandenburger & Stuart, 1996).

An important question emerges: How does business model design influence the competing claims to total value created by different business model stakeholders? Drawing on Porter (1980) and Kogut (2000), we reason that the value eventually appropriated by the focal firm hinges on the bargaining power of the focal firm relative to other business model stakeholders. Thus, the *secondary* effect of the business model design theme on firm performance is affected by the bargaining position of the focal firm. Our model suggests a positive association between the value created by the business model and the performance of the focal firm if, for a given level of competition, the focal firm's bargaining power does *not decrease*. In other words, accentuating a certain business model design theme does not lower the firm's ability to appropriate value if it does not reduce the focal firm's bargaining power.

Environmental conditions are important to consider when explaining the performance of entrepreneurial firms. Munificence, dynamism, and complexity are all important dimensions of the environment that could be examined (Dess & Beard, 1984). We have chosen to focus on munificence for several reasons. First, the use of munificence as a focal construct derives from a resource dependence view of organizations that treats environments as arenas in which all compete for resources (Pfeffer & Salancik, 1978; Aldrich 1979). This perspective seems particularly relevant for entrepreneurial firms, which depend on external resources for survival. Second, beginning with Staw and Szwajkowski (1975) there has been a long research tradition that has examined munificence as the most salient dimension of

environmental uncertainty (see Pfeffer & Salancik, 1978; Castrogiovanni, 1991). Third, in our study, munificence was the dimension of the environment most likely to reflect the abrupt change that occurred in March 2000 (Park & Mezas, 2003). It may not be plausible that any of the other measures suggested by Dess and Beard (1984) for understanding environmental uncertainty, such as complexity or dynamism, could capture such an abrupt change over a relatively short time period.

Following the call by Castrogiovanni (1991) for more clarity in munificence research, we conceptualize environmental munificence at the macro level. Building on the work of Aldrich (1979), Dess and Beard (1984), and Tushman and Anderson (1986) we define munificence as the extent to which the environment supports growth. Specifically, munificence refers to the scarcity or abundance of critical resources required to create and grow entrepreneurial firms. From the point of view of the entrepreneur, these resources may refer to supply (e.g., financial capital) or demand (e.g., customers). Our conceptualization thus builds on established notions of munificence such as capacity, growth/decline, and opportunity/threat (Castrogiovanni, 1991), yet it emphasizes and adds aspects that are critical for entrepreneurial firms.

The performance prospects of ventures with novel and/or efficient business models may vary with the availability and costs of resources that entrepreneurs can access. Environments with high munificence impose fewer constraints on entrepreneurs than those with low munificence. According to Randolph and Dess (1984), munificence influences the survival and growth of existing companies, as well as the ability of new firms to enter the market. Resource munificence may also have a moderating effect on performance (McArthur & Nystrom, 1991).

Efficiency-centered Business Model Design and Performance

We build on Transaction Cost Economics (TCE) (see Williamson, 1975; 1983) to examine the performance implications of efficiency-centered business models. This is

appropriate as both TCE and the business model construct refer to the design of economic transactions. According to basic TCE, exchange attributes like information asymmetry or complexity determine the organization of transactions into markets or hierarchies so as to minimize transaction costs (Williamson, 1983), and maximize performance (Poppo & Zenger, 1998). TCE scholars generally assume that economic actors whose transactions are not aligned with appropriate governance structures are “more likely to display poor financial performance ... than those whose transactions are properly aligned” (Silverman, 2001: 484). Poppo and Zenger (1998) have explicitly modeled the performance implications of TCE by introducing firm and market performance as a construct that mediates the relationship between exchange attributes and firms’ make-or-buy decisions. Milgrom and Roberts (1992: 29-30) elaborate on the effect that transaction costs have on firm performance and profitability by distinguishing between coordination costs and motivation costs. Williamson (1999) points to another promising avenue to address the performance implications of transaction design by integrating the TCE and competence perspectives. Taken together, these recent theoretical developments in TCE suggest that there is an important direct relationship between transaction design and firm performance.

While TCE scholars often assume attributes of individual exchanges as given, we suggest that holistic business model design may affect the properties of a collection of exchanges between the focal firm and business model stakeholders. The essence of an efficiency-centered business model, for example, is the reduction of transaction costs it engenders. This reduction can derive from the attenuation of uncertainty, complexity, or information asymmetry (Williamson, 1975). Prior research on the economics of transactions has focused on the ways that investments in information technology can directly reduce coordination costs and transaction risk (Clemons & Row, 1992). Examples of efficiency-centered business model designs include ones that help firms reduce or avoid inventory and shipping costs and those that lower the probability of transaction errors, such as by providing

order tracking services. Consequently, we expect a positive primary effect on firm performance of adopting an efficiency-centered business model design.

In order to predict the overall effect of an efficiency-centered business model design on firm performance, we must also consider the secondary effect. Is the focal firm able to appropriate some of the value that its business model generates? We suggest that, *on average*, an increase in the business model's focus on efficiency will not decrease the focal firm's bargaining power relative to other business-model stakeholders, such as partners, suppliers, or customers. We arrive at this conclusion by considering the impact of the major characteristics of efficiency-centered design on the main dimensions of the focal firm's bargaining power. These dimensions include access to information, the cost of replacing an exiting stakeholder, the switching cost for the exiting stakeholder, and the ability of stakeholders to take unified action (Coff, 1999).

One aspect of efficiency-centered design is that it enables better information flow among stakeholders and reduces information asymmetries among the parties. It also reduces transaction complexity by streamlining transactions and implementing deep linkages among business-model stakeholders that often do not require transaction-specific investments, such as through the use of web services. These effects are likely to affect the switching costs for *all* parties in the same direction so that, in the aggregate, the balance of power will not shift. Lastly, it should be noted that reducing direct transaction costs (e.g., search, transportation, and coordination costs) increases the pool of potential customers as well as partners and suppliers and thus implies a consequent reduction in the cost to the focal firm of replacing such stakeholders. These arguments suggest that, on balance, more pronounced efficiency-centered business model design does not decrease the focal firm's bargaining power. Ignoring for the moment the potential moderating effect of the environment, we, therefore, expect a positive effect of efficiency-centered business model design on firm performance.

Hypothesis 1a: The more efficiency-centered a focal firm's business model design, the higher is the focal firm's performance.

When resources are scarce and not readily available to entrepreneurial firms, efficiency-centered business model design assumes greater importance as a differentiating factor among business models than in periods of resource munificence. In tough economic environments, consumers and businesses spend and invest less; cost savings become relatively more important as a driver of value creation. Conversely, during times of high environmental munificence, total value can be enhanced, for example, by tapping additional revenue streams. In other words, in environments characterized by low resource munificence, the advantages derived from transaction cost savings are accentuated, while our arguments about the bargaining power of firms with efficient business models continue to hold. Firms with efficiency-centered business model designs are poised to take advantage of transaction cost savings, and they will not suffer a decrease in their aggregate bargaining power vis-à-vis other business model stakeholders. Thus, efficient business model design will be more distinctly associated with better firm performance when resources are scarce than when they are abundant.

Hypothesis 1b: In environments characterized by low resource munificence, the positive association between efficiency-centered design and the performance of the focal firm will be greater than in environments with high resource munificence.

Novelty-centered Business Model Design and Performance

At the heart of entrepreneurship lies the act of innovation, which can be defined as “employing existing resources in a different way, in doing new things with them, irrespective of whether those resources increase or not” (Schumpeter, 1934: 68). This Schumpeterian logic of innovation through recombination of resources can be applied to new or existing firms (e.g., Galunic & Rodan, 1998), but also to new and existing business models. For example, a firm could reconfigure the ways in which its own competencies are linked with those of its partners, suppliers, and even customers (Von Hippel & Katz, 2002). Hence, the essence of novelty-centered business model design is the conceptualization and adoption of new ways of conducting economic exchanges, which can be achieved, for example, by connecting

previously unconnected parties, by linking transaction participants in new ways, or by designing new transaction mechanisms. Business model innovation may complement innovation in products and services, methods of production, distribution or marketing, and markets (Schumpeter, 1934). A novel business model either creates a new market, or innovates transactions in existing markets.^{vi} Thus, the business model may serve not only to exploit an opportunity for wealth creation, but it may also be part of the opportunity development in and of itself. The entrepreneur-as-designer can co-create opportunities, for example, by bridging factor and product markets in new ways.

Business model innovation may give rise to entrepreneurial rents (Rumelt, 1987: 143), hence to increased value-creation potential due to entrepreneurial activity. These monopoly-type rents may accrue to business model stakeholders between the time an innovation is introduced and the time it is diffused. Thus, we expect a positive primary effect of novelty-centered business model design on firm performance.

Entrepreneurial rents may accrue to *all* stakeholders in the business model. Thus, in order to predict the overall effect of novelty-centered business model design on the performance of the focal firm, we must also consider the secondary effect of novelty-centered design on the ability of the focal firm to appropriate some of the value that its business model generates. We suggest that, *on average*, an increase in business model novelty will not decrease the focal firm's bargaining power relative to other business model stakeholders. The focal firm is the innovator, and its business model is the locus of innovation. The higher the degree of business model novelty, the higher the switching costs for the focal firm's customers, suppliers and partners, and hence the higher the focal firms relative bargaining power vis-à-vis these parties. Therefore, we expect a positive effect of novelty-centered business model design on firm performance.

Hypothesis 2a: The more novelty-centered a focal firm's business model design, the higher is the focal firm's performance.

We suggest that in periods of high resource availability, novelty-centered business model design will matter more for firm performance than in periods of resource scarcity. In times of high resource munificence, firms have easier access to the resources necessary to support and implement their business model innovations, such as making investments in complementary assets. In other words, in environments characterized by high resource munificence, the advantages derived from business models are accentuated, while our arguments about the bargaining power of firms with novel business models continue to hold. Firms with novelty-centered business model designs are poised to take advantage of the greater willingness of customers to spend, and they will not suffer a decrease in their aggregate bargaining power vis-à-vis other business model stakeholders. Thus, novel business model design will be more distinctly associated with higher firm performance when resources are abundant than when they are scarce.

Hypothesis 2b: In environments characterized by high resource munificence, the positive association between novelty-centered design and the performance of the focal firm will be stronger than in environments with low resource munificence.

Interaction between Novelty-centered and Efficiency-centered Business Model Design and Performance

Do the above arguments imply that entrepreneurial firms should embrace both efficient and novel business models? Indeed, the need for balancing design elements has been recognized by researchers who highlight the benefits of reconciling distinct aspects of design, such as the familiar and the unfamiliar (Hargadorn & Yellowlees, 2001), and conformity and differentiation (Deephouse, 1999). This line of reasoning suggests that novelty and efficiency are complementary design themes, and thus the effect of their interaction on performance should be positive. First, increasing the degree of novelty of a business model may enhance the return on efficiency-centered design. As previously discussed, novelty-centered business model design makes a business model more distinctive, and this may result in increased switching costs for other business model stakeholders because of fewer comparable

alternatives. Hence, by emphasizing business model novelty, the focal firm has a better chance to appropriate some of the value it creates through increased efficiency. Second, increasing efficiency may enhance the return on novelty. Novel business models that are also efficient may appeal to a wider range of consumers (i.e., not only to those who are intrigued by its novel elements, but also to those who appreciate lower transaction and coordination costs). Thus, by simultaneously emphasizing business model efficiency and novelty the focal firm has a chance to create even more value than through either novelty-centered or efficiency-centered business model design alone.

Hypothesis 3: The more novel and efficient the business model, the higher the performance of the focal firm.

However, another line of reasoning suggests that attempts by entrepreneurs to design their business models concurrently for higher efficiency *and* greater novelty may also adversely affect firm performance. Embracing two major design themes in parallel could lead to suboptimal resource allocation. Given their limited resources, entrepreneurial firms that try to achieve too much at once may find that they are not getting adequate returns on their design efforts and investments. This is because a lack of focus may confuse market participants, create technological and organizational problems, and lead to higher costs. Furthermore, it has been shown that a firm that gets stuck between innovation and imitation – or, analogously, between novelty and efficiency as design themes – may perform poorly because it misses out on the opportunity to learn to become an even more skillful innovator or imitator (Zott, 2003). In summary, there might be diseconomies of scope in design resulting from bundling novel and efficient design elements.

Hypothesis 4: The more novel and efficient the business model, the lower the performance of the focal firm.

DATA AND METHODS

Sample

To test our hypotheses, we took advantage of the possibilities that advanced information and communication technologies offer for the design of business models, and we studied the business models of firms that derived all or part of their revenues from transactions conducted over the Internet. We examined the business models of firms that had gone public in Europe or in the US between April 1996 and May 2000. This sample selection strategy enabled us to create a data set of 309 relatively young, fast-growing entrepreneurial firms and their business models, from which we randomly sampled 190. We considered public companies in order to ensure the availability of data provided. Data collection from initial public offering documents is an acknowledged method for studying entrepreneurial firms (e.g., Dowling and McGee, 1994).

Data Collection

For each business model design theme, we built composite scales, and identified and measured relevant items in a survey instrument. The surveying process proceeded in five stages: (1) development of survey instrument, (2) development of measurement scales, (3) pre-testing of survey, (4) development of online web interface and of central database, and (5) data collection.

Following the increasing use of panelists in management research (e.g., Iansiti & Clark, 1994; Lee, Smith, & Grimm, 2003; MacCormack, Verganti, & Iansiti, 2001), we hired eleven part- or full-time research assistants (primarily MBA students), and trained them as raters to fill in the survey instrument for assigned sample companies. We carefully selected our raters from a larger pool of applicants by interviewing them and asking them to submit an abbreviated test survey on a randomly chosen, sample company to display their understanding of Internet-based business models. After choosing the most qualified candidates, we trained them in data collection and data analysis. In addition, raters were provided with written guidelines on how to properly address survey items. Moreover, each rater was assigned to one of two project managers, who reviewed completed surveys for internal consistency and

completeness, but not for the accuracy of each individual measurement. On average, it took a rater about two and a half days to collect data on a given business model, to analyze the model, and to complete the survey. Data sources included IPO prospectuses, annual reports, investment analysts' reports, and web sites. The data were collected from May 2000 to June 2001. During that time period, we were able to take one measurement of the design themes for each of the 190 business models in our sample. In other words, we collected cross-sectional data on our independent variables. We verified that our sample firms had not substantially changed their business models in the time period under consideration (i.e., from the end of 1999 to mid-2001) to ensure that the measured business model design variables could be set in relation to performance indicators from both 1999 and 2000. Those companies that had made substantial changes to their business models were dropped from the analysis.

We validated inter-rater reliability by assigning a randomly chosen business model to two different raters (each of whom was assigned to a different project manager), and by conducting a pair-wise comparison of responses, yielding a Cronbach alpha of 0.81, and a Pearson correlation coefficient of 0.72. Raters were in broad agreement with each other for 82% of the individual items. We repeated the test periodically for different raters and different business models and found that all indicators of reliability had further improved.

Independent Variables

Two latent variables characterize the design of a business model as independent variables in our study: efficiency and novelty. We used 13 items as measures of efficiency, and 13 items as measures of novelty. Given the difficulty of obtaining objective measures of business model design, we deemed the use of perceptual measures obtained from our raters appropriate (Dess & Robinson, 1984). The strength of each of these items in a given business model was measured using Likert-type scales (see Appendix A for details) and coded into a standardized score. After coding, we aggregated the item scores for each design theme into an overall score for the composite scale using equal weights (see Mendelson, 2000). This process

yielded distinct quantitative measures of the extent to which each business model in the sample leveraged efficiency and novelty as design themes. (See Table 3 for summary statistics)

We validated the internal consistency and reliability of our measures using standardized Cronbach alpha coefficients, which were 0.69 for the efficiency measure and 0.72 for the novelty measure. Hence, our measures sufficiently satisfy Nunnally's (1978) guidelines, which suggest 0.7 as a benchmark for internal consistency. In order to demonstrate the convergent and discriminant validity of our measures, we ran a Confirmatory Factor Analysis (CFA). We also employed a Partial Least Squares (PLS) approach to further strengthen our claim about discriminant validity. The methods and the results are detailed in Appendix B. Both empirical tests provide support for the construct validity of our measures.

Dependent Variables

A firm's stock-market value reflects the market's expectations of future cash flows to shareholders, and hence can be viewed as a measure of *perceived* venture performance, as opposed to *realized* performance which is typically embodied in historical measures of firm profitability (e.g., ROI, ROA). Given the level of uncertainty often associated with the true prospects of entrepreneurial ventures, perceived performance operationalized as stock market value is a measure that is particularly appropriate in an entrepreneurship setting (Stuart, Hoang, & Hybels, 1999). Measures of realized performance such as ROI, ROA, or Tobin's q are less appropriate for young, high-growth entrepreneurial firms that often have negative earnings, few tangible assets, and low (even negative) book values.^{vii}

We acknowledge the limitations of using stock-market valuation as a dependent variable. Yet this measure captures the sensitivity to market participants' perceptions of booms and busts in the business cycle. It has also been suggested as a measure for wealth creation (e.g., Certo et al., 2001; Ireland et al., 2001). In our cross-sectional analysis we examine variations in stock market value among sample firms at given points in time (e.g.,

close of Q4 1999 and close of Q4 2000), and as long as all firms in our sample at a given point in time are exposed to the same set of market expectations, this should not affect the results of our multivariate analysis. Indeed, the fact that market valuations are sensitive to the business cycle, and thus to the level of perceived resource munificence in the environment, turned out to be beneficial for our analysis as it allowed us to test our contingency hypotheses about the moderating effect of resource munificence on the relationship between business model design and firm performance.

Since most firms in our sample have relatively low levels of debt, the market value of a firm's equity is a good approximation of the market value of the whole firm. We measured the market value of equity at a given date as the number of shares outstanding multiplied by the firm's stock price, taken from the combined CRSP and Datastream databases. We then took the logarithm of the market value of the equity in order to comply with the normality assumption of OLS. Following this transformation, we found that the null hypothesis of normality could not be rejected at the 5% level of significance using a Shapiro-Wilk test. To test our hypotheses, we used measurements of the dependent variable at various points in time and in various time periods characterized by different levels of resource munificence for entrepreneurial firms (see Table 2).^{viii} Most empirical research has hitherto employed industry-type measures of the munificence construct, such as mean annual industry sales growth (Tushman & Anderson, 1986), employment growth in the industry (Dess & Beard, 1984), and other indicators of growth at the industry level (McArthur & Nystrom, 1991). Because the business model construct spans industry boundaries and many of the sample firms span multiple industries, we could not define an industry-level variable that captured resource munificence adequately. We therefore measured the dependent variables in time periods that were sufficiently distinct in terms of environmental resource munificence, yet close to the point in time when the independent variables were measured.

We note that despite the short window, the change in the resource availability for entrepreneurial firms triggered by the worldwide crash of high-tech stocks in March 2000 has been severe. Park and Mezias (2003), for example, demonstrate the sharp and statistically significant reversal in a number of munificence measures – such as average number of firms listed on NSDAQ that file for bankruptcy per month, average number of firms filing for an IPO on NASDAQ per month, and various average monthly return figures on stock market indices for emerging growth firms. “Overall, the e-commerce sector experienced an interesting munificence pattern: high, and relatively sustained levels of resource munificence until March 2000, followed by a period of sudden and sustained decline in the level of resource munificence” (2003: 7). Table 2 summarizes the differences between the time periods we considered, indicating that the year 1999 (and Q4 1999 in particular) was a time of relatively high munificence for entrepreneurial firms, whereas the year 2000 (and Q4 2000 in particular) was a time of relatively low munificence for the firms in our sample.

INSERT TABLE 2 ABOUT HERE

The use of multiple measures of the dependent variable provided a robustness check for our results. In our analysis, we contrast the average market value of firms in Q4 1999 with that in Q4 2000, the market value of firms at the close of Q4 1999 with that at the close of Q4 2000, and the average market value of firms in 1999 with that in 2000.

Control Variables

We included further factors that might influence the market value of a firm’s equity as control variables in the analysis because their omission might confound the analysis. Our industry controls were the level of competitive threat^{ix} (expected sign: negative), and estimated market size^x (expected sign: positive). Our firm controls included age of the firm (expected sign: positive)^{xi}, size (expected sign: positive), country of origin (expected sign: negative)^{xii}, as well as R&D, advertising, and capital expenditures (expected signs: positive)^{xiii}. The inclusion of these variables strengthens the claim that our analysis captures

the influence of distinct business model design characteristics on firm performance as opposed to the effects of organizational characteristics or firm strategy. For example, investment in R&D has been used in prior research as a proxy for technology strategy (Dowling & McGee, 1994), and also as a proxy for the degree to which a firm pursues a product differentiation strategy (Mizik & Jacobson, 2003). Moreover, advertising expenditures have been employed as a proxy for a firm's marketing, i.e., value appropriation strategy (Mizik & Jacobson, 2003).

Finally, we considered alternative business model design themes, such as complementarities and lock-in (Amit & Zott, 2001), by constructing two latent control variables, using nine indicators for complementarities (Cronbach alpha = 0.70), and 15 indicators for lock-in (Cronbach alpha = 0.74).

Econometric Modeling and Estimation Approach

We analyzed the data using multivariate regression techniques, and confirmed that none of the conventional assumptions underlying OLS regression analysis were violated by our data. For example, using White's general test for homoskedasticity, we found no evidence of heteroskedasticity.

We tested the robustness and validity of our model specification in several distinct ways. First, we tested for multicollinearity among independent variables by calculating Variance Inflation Factors (VIF) (see Kleinbaum et al., 1998). Second, we performed analyses using different dependent variables. Third, we discarded influential observations from our data set to see whether they distorted results.^{xiv} Fourth, we tested for over-fitting of the data.^{xv} Fifth, we considered the potential bias introduced by sampling on the dependent variable by running a truncated regression model.^{xvi} None of these tests gave rise to concern. Yet, we observed multicollinearity in those regressions where the interaction term between novelty and efficiency was included. We therefore mean-centered the interaction variable, as well as the novelty and efficiency measures (see Aiken & West, 1991). This significantly reduced the

VIF to levels that eliminated the concern about multicollinearity. In addition, we ensured that the mean-centering approach did not entail a lack of invariance of regression coefficients, which may arise in equations containing interactions even under simple linear transformations of the data (Aiken & West, 1991). Overall, therefore, our model specification proved robust and valid.

RESULTS

Descriptive Statistics

Table 3, Panel A provides an overview of the data set we assembled. It reveals the entrepreneurial nature of our sample firms as well as the enormous change that occurred in the environment between Q4 1999 and Q4 2000. Specifically, in 1999 the median age of a sample company was just over 4 years old, while the mean company was just under 7 years old. The few older firms in the sample are ones that went through an extensive transformation with entrepreneurial management leading the change. The median sales of sample companies in 1999 were just under \$25 million, while the median book value of equity in 1999 was \$57 million. The median sample company employed 269 people (mean 1,067). With respect to the change in the environment between 1999 and 2000 we note that the median company was worth \$349 million at the end of December 1999, and only \$49 million at the end of December 2000, representing a decline of 85.6% in market value over a 12 month period.

INSERT TABLE 3 Panel A ABOUT HERE

Table 3, Panel B depicts the Pearson Correlations among the right-hand side variables used in the regression analysis. We note that while some correlations among the explanatory variables are significant, they do not pose a multicollinearity problem as the Variance Inflation Factors (VIF) are low for all these variables.

INSERT TABLE 3 Panel B ABOUT HERE

Hypotheses Tested

Table 4 depicts the OLS regression results. Panel A shows the results for regressions in which the dependent variable is the logarithm of market value averaged over the fourth quarter of 1999 (top display), and 2000 (bottom display). Panel B summarizes the main regression results for each of the three dependent variables we considered. Panel C depicts the results of the same regressions reported in Panel A on a restricted sample of firms that were present in both 1999 and 2000. In other words, the regressions reported in Panel C control for entry to and exit from our sample between 1999 and 2000.

INSERT TABLE 4 Panels A, B AND C ABOUT HERE

Hypothesis 1a (regarding efficiency-centered business model design) receives mixed support from our data. The results in Table 4 indicate that H1a is supported by the Q4 2000 results in the full sample (Panel A: Models 1-4 in the bottom display). The results are robust across all dependent variables (see Panel B). In our full sample, during a period of resource scarcity, entrepreneurial firms performed better if their business model design, and hence value proposition to their customers, partners, and suppliers included efficiency enhancements that reduced their operating costs, simplified transactions, sped up processes, enhanced the utilization of capital equipment, enabled companies to capture economies of scale and scope, and more.

However, we find that H1a is not supported by the data pertaining to Q4 1999. The top display in Table 4, Panel A, which depicts the regression results during a period of environmental munificence (1999), shows that while the coefficient of the mean-centered efficiency index is positive, it is not significant. That is, during this period of abundant resources and record-high valuations of stocks, efficiency-centered business model design did not serve to differentiate significantly among entrepreneurial firms.

We also note the lack of support that H1a receives from the regressions done on the restricted sample (see Panel C, bottom display). The coefficient on efficiency is insignificant

in the restricted sample for each of the models we ran, yet, as noted above, it is significant in the full sample for Q4 2000. What accounts for the difference? We probed deeper into the underlying reasons by running a separate set of regressions using only those 30 firms that entered the sample in 2000.^{xvii} We observed that these firms have significant positive coefficients for efficiency-centered business model design in 2000, which were also significantly different from the respective coefficients in the restricted sample in 1999 (according to the t-test suggested by Cohen and Cohen (1983:111)). This may have strengthened the efficiency effect in the full sample.

Regarding the contingent effect of environmental munificence, the above analysis highlights the role of entry dynamics. Specifically, under low resource munificence capital markets may be more receptive to new public offerings of firms that center their value proposition on lower costs. This in turn may favor the IPOs of firms that have more efficiency-centered business model designs.

Overall, however, we find that Hypothesis 1b is only partially supported by our empirical analysis. Following Gatignon (2003), we examined the moderating role of environmental munificence by conducting a Chow test for the equality of the coefficients in the overall model between the 1999 and 2000 regressions. The test provided significant results (see Table 5). This led us to further examine whether the coefficient on efficiency caused the observed structural break, which is suggested by Table 4 Panel B. The table shows that the regression coefficients on the efficiency variable were not significant in 1999, and significant in 2000. (Note, however, the same effect cannot be observed in the restricted sample.) We attempted to confirm whether this effect was statistically significant by running a pooled regression with dummy variables which included our observations from 1999 and 2000 (Gatignon, 2003). We could not reject the null hypothesis that the coefficient on efficiency was the same in 1999 and 2000.

INSERT TABLE 5 ABOUT HERE

Hypothesis 2a (regarding novelty-centered business model design) is supported by the analysis. As depicted by Table 4, Panels A, B, and C, the coefficient on the novelty variable is positive, and in most cases it is significant both during a period of environmental munificence and during a period of resource scarcity. The observed effect was thus relatively robust to changes in the environment. Our results suggest that even in times of resource scarcity and less uncertainty about the viability of business model designs, innovative business model designs were associated with higher levels of performance. This is consistent with the theoretical arguments presented earlier.

Probing deeper into the effects of exit from, and entry to our sample, we first note that the coefficient on the novelty variable is significant at the 10% level in the full sample for three of the four models we ran (see Panel A), while it is significant at the 1% level in the restricted sample for all four models (see Panel C). Second, using the regressions on the 30 firms that entered our sample in 2000, we observed that in three of the four models the coefficients for novelty-centered business model design were insignificant. That is, the novelty-centered business model design of the firms that had an IPO in 2000 did not significantly explain the variance in the dependent variable. Furthermore, according to the t-test suggested by Cohen and Cohen (1983:111) the coefficient on novelty in the sample of entering firms was also significantly different from the respective coefficient in the restricted sample in 1999.

This analysis highlights again the potential role of entry dynamics for the contingent effect of munificence on the relationship between business model design and firm performance. Specifically, under low resource munificence capital markets may be less receptive to new public offerings of firms that center their value proposition on novel business models.

Overall, however, Hypothesis 2b about the changing strength of the novelty coefficient in different environments receives only partial support from our data. While the Chow Test

suggests a structural break in the overall model parameters between 1999 and 2000 (see Table 5), and while Table 4 Panel B suggests a weakening of the novelty effect from 1999 to 2000, a pooled regression analysis with dummy variables (Gatignon, 2003) did not allow us to reject the null hypothesis that the coefficient on novelty was identical in 1999 and 2000.

Hypothesis 3 regarding the interaction effect among the design themes of business models received no support from the empirical analysis: none of our regressions revealed a significant positive interaction. Indeed, the coefficient of the variable capturing the interaction between novelty and efficiency had a negative sign in all the regressions we ran, yet it was statistically insignificant in most (e.g., see Table 4, Panels A and C). That coefficient, however, was significant at the 10% level in Model 4 for the full sample when we used our other two dependent variables, namely the logarithm of the market value of firms at the close of Q4 2000, and the logarithm of the average market value of firms in 2000.^{xviii} In other words, our data seem to suggest, yet do not convincingly prove that there appear to be diseconomies of scope in design. That is, on average, attempting to emphasize both efficiency and novelty in the design of a business model may be costly as it adversely affects performance. Our analysis therefore provides preliminary, albeit statistically weak support for Hypothesis 4.^{xix}

DISCUSSION AND CONCLUSION

Recent research has pointed to the validity and usefulness of a multi-level research design for understanding the performance of entrepreneurial firms (e.g., Gulati et al., 2000; Hite & Hesterly, 2001; Human & Provan, 1997). In this paper, we integrate transaction cost economics and Schumpeter's theory of innovation and link multiple levels of analysis in order to explain how value creation through the business model may translate into value capture by the firm. Our paper thus contributes to the emerging debate on value creation versus value appropriation in the management and marketing fields (e.g., Brandenburger & Stuart, 1996; Hitt, Amit, Lucier, & Nixon, 2002; Mizik & Jacobsen, 2003). The study also contributes to

the emerging literature on business models and on boundary-spanning organizational designs that are relevant to the study of innovation and entrepreneurship (e.g., Amit & Zott, 2001; Hargadorn & Yellowlees, 2001; Mendelsohn, 2000; Magretta, 2002).

By identifying critical dimensions of business model design, which we refer to as design themes, and by measuring and quantifying these dimensions, we show that business model design matters to the performance of entrepreneurial firms, in particular, novelty-centered design. Our analysis is also indicative of the potential differential impact that business model design themes may have on performance under varying environmental conditions. Lastly, our results point to the possibility of diseconomies of scope in design, that is, entrepreneurs' attempts to incorporate both efficiency- and novelty-centered design elements in their business models may be counterproductive.

Our strongest and most robust finding relates to the novelty theme of business model design. It centers on innovation, which is "the specific instrument of entrepreneurship. It is the act that endows resources with a new capacity to create wealth" (Drucker, 1985: 30). Such wealth-creating innovation may be achieved through a recombination of existing resources (Schumpeter, 1934) in new designs. Our study shows that firms are not only able to innovate by recombining the resources they control, but also by harnessing those of the partners, suppliers, and customers who are part of their business model. When examining the same set of entrepreneurial firms over periods of high- and low-resource munificence, we find that novelty-centered business model design is positively associated with performance.

When Gatignon et al. (2002) focused on the importance of one type of innovation -- technology novelty -- they found that the more radical, more competence-enhancing, and more oriented towards generational expansion a product innovation was, the greater would be the innovation's commercial success. In contrast with the commonly held view that more innovation is better, however, Meyer and Roberts (1986) established that lower levels of product newness -- in particular lower levels of market newness in technology-based firms --

were associated with higher sales growth rates. The authors do assert, nonetheless, that some novelty is better than no novelty at all, which suggests an inverted-U type of relationship between novelty and firm performance. Thus, prior research points to the need to carefully qualify the object of innovation (e.g., product, or process), the type of firm performance (e.g., survival, perceived success, or sales growth), and the nature of contingencies (e.g., high versus low munificence) when examining the link between innovation and firm performance. The research presented in this paper contributes to this literature by highlighting the business model as an important locus of innovation, and by analyzing its contingent effect on firm performance.

Business model design not only may allow entrepreneurs and entrepreneurial managers to exploit opportunities, but also may permit them to create and shape them. This perspective suggests conceptualizing opportunities as endogenous to the entrepreneurial process. It also suggests integrating entrepreneurial and strategic perspectives (Hitt, Ireland, Camp, & Sexton, 2001; 2002). Entrepreneurs may formulate their business model alongside their business strategy.

Overall, our analysis points to the business model as an emerging unit of analysis for entrepreneurship and management research. We provide empirical support for the suggestion that the design themes of a firm's business model are determinants of performance. These business model-specific effects may explain some hitherto unexplained variance in the performance among firms; in this sense, they complement, but do not replace, firm-specific and industry-specific effects on firm performance (Rumelt, 1991; Hawawini et al., 2003; McGahan & Porter, 2002). Moreover, our analysis underlines the potential of adopting a configuration approach to studying organizations. In particular, we show that capturing configuration as variables, as suggested by Miller (1996), helps us characterize and measure business model designs.

Our study also offers important implications for practitioners. First, we corroborate the premise that in a highly interconnected world, entrepreneurs and entrepreneurial managers alike may consider looking beyond firm and industry boundaries in order to create and capture business opportunities. Second, entrepreneurs not only need to strike a balance between novel and familiar design elements (Hargadorn & Yellowlees, 2001), they also must pay attention to the choice and mix of particular design themes (i.e., novelty versus efficiency) under different environmental conditions, especially when accessing public capital markets.

We acknowledge several limitations of this study. Some empirical results could be affected by measurement problems. For example, our measurement of business model design themes may not have captured all lines of a firm's business that have revenue potential; hence, it might not explain all the variation in the dependent variable. Another problem could be that bad management corrupts inherently good designs. Unfortunately, our data do not allow us to control for the quality of management. As well, data limitations do not allow us to engage in a dynamic analysis of business model evolution or to measure value creation at the business-model level directly in our analysis.

Despite these limitations, we hope this article inspires further theoretical and empirical research on business models to improve our understanding of why some entrepreneurial organizations succeed while others fail. The perspective of the business model and the consideration of salient business model characteristics promise to enrich research on emerging organizations.

ENDNOTES

ⁱⁱ The implications of cross-level business design can be far-reaching. For example, Hargadorn and Yellowlees (2001: 494) describe the failure of Prodigy, an on-line service in which investors had invested \$600m, due to the mismatch between the design of its business model and customer needs.

ⁱⁱⁱ The focal firm in a business model design is the one that created the business model.

^{iv} In this paper, we use the terms novelty and innovation interchangeably. We use the term novelty in the context of business model design in order to distinguish it from other kinds of innovation, such as product or process innovation.

^vAccording to Amit and Zott (2001: 511), "*Transaction content* refers to the goods or information that are being exchanged, and to the resources and capabilities [including relational capabilities] that are required to enable the exchange. *Transaction structure* refers to the parties that participate in the exchange and the ways in which these parties are linked ... Finally, *transaction governance* refers to the ways in which flows of information, resources, and goods are controlled and coordinated by the relevant parties." Afuah and Tucci (2000), Chesbrough and

Rosenbloom (2002), and Magretta (2002) offer alternative definitions of the business model that are complementary to that of Amit and Zott (2001).

^{vi} A business model can create an entirely new market by mobilizing customers for a new type of product or service. eBay is a case in point. Flea markets have existed for centuries, but they have historically been a highly localized business. Their scope and liquidity were limited by time, space and logistical constraints. By creating an on-line flea market, the eBay business model enabled market participants to monetize assets and trade even low-ticket items as well as time-sensitive items as many major transaction costs were all but eliminated.

^{vii} For instance, 134 firms in our sample (i.e., 86% of the sample firms on which we had the relevant accounting data) had negative earnings in Q4'99. Five firms (i.e., 3% of the sample firms on which we had the relevant data) even had a negative book value in the same period. These numbers did not change substantially in Q4'00.

^{viii} We did not have time-series data on our independent variables; therefore, we could not simply pool the data, introduce a year dummy 2000 and test the hypothesized interaction effect directly, for example through a random effects panel data specification.

^{ix} Our raters measured competitive threat on a four-point Likert scale based on information found in annual reports, prospectuses, competitors' SEC documents and web sites, Forrester benchmark studies, Hoovers' database (which lists each focal firm's main competitors), as well as investment analyst's reports.

^x This information was obtained from Forrester research reports and from the US Department of Commerce.

^{xi} Older firms have a more established brand and reputation and a larger customer base.

^{xii} We controlled for country of origin using a dummy variable ("1" for firms headquartered in North America, "0" for European firms). Firms listed on European stock exchanges may have been valued higher than their North American counterparts during 1999-2000 due to tech-hungry investors and a more limited supply of IPOs in Europe.

^{xiii} These variables are proxies for growth prospects based on firm-specific resources and capabilities such as knowledge capital, brand, and physical capital. Consistent with prior research, we set missing values equal to zero, expecting a positive coefficient on all three variables in our analysis.

^{xiv} We discarded several observations based on established criteria for identifying influential points (e.g., leverage, studentized residual, or change in the determinant of the covariance matrix).

^{xv} Over-fitting occurs when the fit of the model with the data is due to the idiosyncrasy of a specific data set, not the fundamental relations among the variables. To see whether this was the case in our study, we first took a random subsample of 150 firms, with the remaining firms constituting the holdout sample. We then calibrated the model based on the subsample, and applied the resulting parameter estimates to the holdout sample, calculating goodness-of-fit, pseudo F-value, and Theil U statistic.

^{xvi} The truncated regression model accounts for a possible sample selection bias by maximizing the log likelihood function of the model (see Maddala, 1986). We used the "truncreg" function in Stata and assumed that private entrepreneurial firms have market values less than the lowest market value of public entrepreneurial firms which were included in our sample. The coefficient estimates from the truncated regression are analogous to the coefficient estimates from the OLS regression in magnitude, direction (positive or negative), and significance for all models and all dependent variables. In addition, the Wald test in the truncated regression and the F-statistic in the OLS regression are both significant at the 5% level for all models and all dependent variables.

^{xvii} These regressions are not depicted in the paper due to space constraints, but are available from the authors.

^{xviii} For these models we performed post-hoc analysis using plotting techniques suggested by Aiken and West (1991). The plots of efficiency on the respective dependent variable for different values of novelty revealed that for higher values of novelty, the slope of the plotted regression line was smaller, but remained positive. In other words, the plot was consistent with Hypothesis 4, and yielded the additional insight that while diseconomies of scope in design prevail, they do not override the positive effects of efficiency-centered design on performance. Our analysis of novelty-centered design yielded analogous results. Again, for space reasons these models are not reported here.

^{xix} The coefficients on some of the control variables in Table 4 merit a brief discussion. The coefficient on market size is negative for 1999, and becomes positive (but not significant) in 2000. This pattern is consistent with the argument that during periods of resource munificence and high uncertainty, opening new market spaces or entering emerging markets that are believed to be high growth potential spaces are perceived to be associated with high performance. Age is negatively related to firm market value in both the top and bottom displays of Panel A in Table 4, but for the most part highly significant only in 1999. Here again, new entrants enjoyed an enormous premium in capital markets, possibly due to their high growth potential in periods of high munificence and uncertainty.

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APPENDIX A
Survey Items

EFFICIENCY-CENTERED BUSINESS MODEL DESIGN	
Survey Item	Scale*
Inventory costs for participants in the business model are reduced	SA, A, D, SD
Transactions are simple from the user's point of view	SA, A, D, SD
The business model enables a low number of errors in the execution of transactions	SA, A, D, SD
Costs other than those already mentioned for participants in the business model are reduced (i.e., marketing and sales costs, transaction processing costs, communication costs, etc.)	SA, A, D, SD
The business model is scalable (i.e., can handle small as well as large number of transactions)	SA, A, D, SD
The business model enables participants to make informed decisions	SA, A, D, SD
Transactions are transparent: flows and use of information, services, goods can be verified	SA, A, D, SD
As part of transactions, information is provided to participants to reduce asymmetric degree of knowledge amongst them regarding the quality and nature of the goods being exchanged	SA, A, D, SD
As part of transactions, information is provided to participants about each other	SA, A, D, SD
Access to large range of products, services and information, and other participants is provided	SA, A, D, SD
The business model enables demand aggregation	Y, N
The business model enables fast transactions	SA, A, D, SD
The business model, overall, offers high transaction efficiency	SA, A, D, SD
NOVELTY-CENTERED BUSINESS MODEL DESIGN	
Survey Item	Scale*
The business model offers new combinations of products, services and information	SA, A, D, SD
The business model brings together new participants	SA, A, D, SD
Incentives offered to participants in transactions are novel	SA, A, D, SD
The business model gives access to an unprecedented variety and number of participants and/or goods	SA, A, D, SD
The business model links participants to transactions in novel ways	SA, A, D, SD
The richness (i.e., quality and depth) of some of the links between participants is novel	SA, A, D, SD
Number of patents that the focal firm has been awarded for aspects of its business model	0, 1-2, 3-4, >4
Extent to which the business model relies on trade secrets and/or copyrights	R, S, B, N
Does the focal firm claim to be a pioneer with its business model?	Y, N
The focal firm has continuously introduced innovations in its business model	SA, A, D, SD
There are competing business models with the potential to leapfrog the firm's business model	SA, A, D, SD
There are other important aspects of the business model that make it novel	SA, A, D, SD
Overall, the company's business model is novel	SA, A, D, SD
*SA – Strongly Agree (coded as 1), A – Agree (0.75), D – Disagree (0.25), SD – Strongly Disagree (0); Y – Yes (1), N – No (0); R - Radically (1), S - Substantially (0.66), B - a bit (0.33), N - not at all (0); 0 (0), 1-2 (0.33), 3-4 (0.66), >4 (1)	

APPENDIX B
Convergent and Discriminant Validity

We first ran a confirmatory factor analysis (CFA) on a measurement model with two factors, where the efficiency traits loaded onto the efficiency factor, and the novelty traits loaded onto the novelty factor. In this model, the correlation between the efficiency and the novelty index was estimated. We then ran a CFA on a measurement model with only one factor, where the correlation between the efficiency and the novelty variable was constrained to be one. If the model where the correlation is not equal to one improves the fit significantly compared to the constrained model, the two constructs (i.e., novelty and efficiency) are distinct from each other, although they can be significantly correlated (Bagozzi, Yi, & Phillips, 1991; Gatignon, Tushman, Smith, & Anderson, 2002; Gatignon, 2003).

We also used CFA to establish the convergent validity of the constructs, by comparing a measurement model where the correlation between the two constructs was estimated with a model where the correlation was constrained to be equal to zero. "A significant improvement in fit indicates that the two constructs are indeed related, which confirms convergent validity" (Gatignon et al., 2002:1109).

We used LISREL to implement the CFA, following the routines described in Gatignon (2003: 178-220). The results from the CFA are displayed in the table below:

Correlation	Chi-squared	Degrees of freedom
0.14	733.4	319
0	735.1	320
1	761.9	320

The results from the CFA demonstrate that efficiency-centered design and novelty centered design are two distinct dimensions of business models, although they are positively correlated (estimated correlation = 0.14). This is confirmed by a significantly (at the 0.01 level) improved confirmatory factor analytic model when the correlation is estimated, compared to a measurement model where the correlation is constrained to 1 (chi-squared = 761.9 – 733.4 = 28.5, degrees of freedom = 320 – 319 = 1). Furthermore, the results from the CFA demonstrate that efficiency-centered design and novelty-centered design are independent dimensions of business models. The confirmatory factor analytic model when the correlation is estimated, compared to a measurement model where the correlation is constrained to 0 is not significantly improved (chi-squared = 735.1 – 733.4 = 1.7, degrees of freedom = 320 – 319 = 1). This is akin to Gatignon et. al’s (2002) result that some dimensions of innovation (e.g., competence-enhancing/destroying) are independent of others (e.g., radicalness), yet all measure important, distinct aspects of innovation.

In addition to CFA, the literature suggests partial least squares (PLS) as another method for assessing discriminant validity. Using PLS, one can determine whether a construct shares more variance with its measures than it shares with other constructs in the model (Hulland, 1999; Reinartz, Krafft, & Hoyer, 2003). This is achieved by (1) calculating the square roots of the Average Variance Extracted (AVE) values, which measure the average variance shared between a construct and its measures, and by (2) calculating the correlations between different constructs. A matrix can then be constructed where the square root of AVE is in the diagonal, and the correlations between the constructs are in the off-diagonal. For adequate discriminant validity, the diagonal elements should be greater than the off-diagonal elements in the corresponding rows and columns (Fornell & Larcker, 1981). In our case, we obtained the following matrix as a result of the PLS analysis. The results further strengthen the discriminant validity of our constructs.

	Efficiency	Novelty
Efficiency	0,233	0,175
Novelty	0,175	0,243

Note: (1) The square root of AVE is displayed in the diagonal, and the correlations between the constructs are displayed in the off-diagonal. (2) According to Fornell and Larcker (1981), if the factor variance is set to 1, then the average variance extracted is defined as: $AVE = \Sigma \lambda_i^2 / \{ \Sigma \lambda_i^2 + \Sigma (1 - \lambda_i^2) \}$.

FIGURE 1: Model of the impact of business model design on firm performance

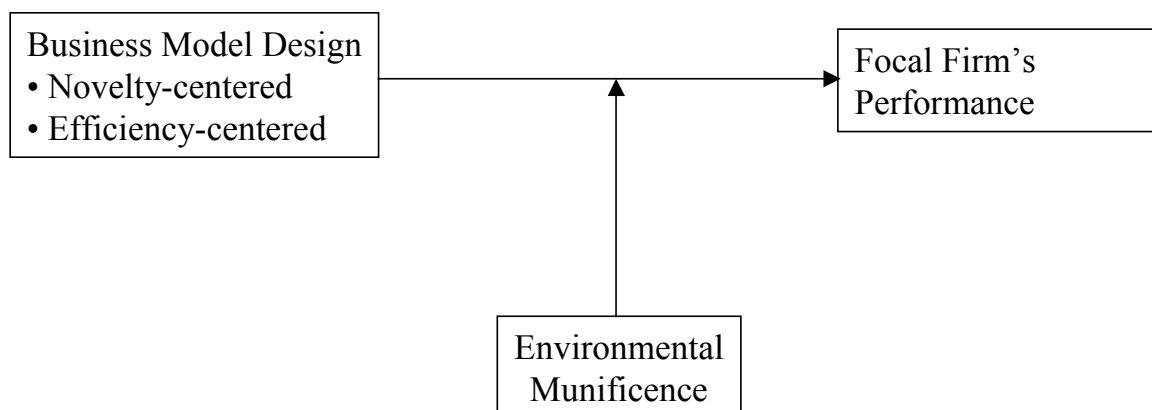


TABLE 1: Distinctiveness of business model and competitive strategy perspectives

	Business Model	Competitive Strategy
Definition	Blueprint of how a firm relates to external stakeholders and how it transacts with them.	Pattern of actions or decisions (planned or emerging) that explain how a firm achieves and maintains competitive advantage.
Main Questions Addressed	<p>How to do business?</p> <ul style="list-style-type: none"> Who are the parties that can be brought together to exploit a business opportunity, and how can they be linked to the focal firm to enable transactions? What information or goods are exchanged among the parties, and what resources and capabilities are needed to enable the exchanges? How are the transactions between the parties controlled, and what are the incentives for the parties? 	<p>How to position firm against rivals?</p> <ul style="list-style-type: none"> How to compete, i.e., what kind of product market positioning approach to adopt (cost leadership and/or differentiation)? What customer segments to target? When to enter the market and how to enter it?
Unit of Analysis	“Ecology” of focal firm	Firm
Value Logic	Mainly value creation logic: enhancing total value created	Mainly value appropriation logic: capturing more value than rivals

TABLE 2: Indicators of resource munificence 1999 and 2000

	1999	2000
Munificence	<ul style="list-style-type: none"> Median quarterly sales growth of sample companies: 30% (Q2'99), 29% (Q3'99), 33% (Q4 '99) Number of Internet-related IPOs in US: 193 (Q4: 62) Public market Internet IPO financings in % of total IPO financings: 67% VC funding for B2C e-commerce companies: \$4.5 billion (+1000% from 1998)^{xx} 	<ul style="list-style-type: none"> Median sales growth of sample companies: 18% (Q1 '00), 15% (Q2'00), 8% (Q3'00), 6% (Q4 '00)^{xxi} Number of Internet-related IPOs in US: 122 (Q4: 0)^{xxii} Public market Internet IPO financings in % of total IPO financings: 36%^{xxiii} VC funding for e-commerce companies dropped from \$843 million (Q1) to \$69 million (Q4)^{xxiv}

^{xx} Source: PriceWaterhouseCoopers, <http://www.ecommercetimes.com/perl/story/2505.html>.

^{xxi} Tushman and Anderson (1986) use annual sales growth as the principal measure for munificence, because demand is one of the basic resources available to firms.

^{xxii} Source: Morgan Stanley, “The Technology IPO Yearbook: 8th Edition – 22 Years of Tech Investing,” March 2002, http://www.morganstanley.com/institutional/techresearch/tech_ipo_yearbook.html?page=research.

^{xxiii} Source: Morgan Stanley, “The Technology IPO Yearbook: 8th Edition – 22 Years of Tech Investing,” March 2002, http://www.morganstanley.com/institutional/techresearch/tech_ipo_yearbook.html?page=research.

^{xxiv} Source: PricewaterhouseCoopers/VentureOne, Money Tree Survey Q4 2000.

TABLE 3, Panel A: Descriptive statistics

Variable Name (Acronym)	Mean	Median	Std. Deviation	Min	Max	No. Observations
Market Value at Close of Q4 1999 USD million (MVQtr4Close_99)	\$1,506	\$349	\$3,184	\$2	\$25,942	159
Market Value at Close of Q4 2000 USD million (MVQtr4Close_00)	\$387	\$49	\$1,101	\$0.7	\$8,885	173
Efficiency	0.702	0.712	0.112	0.404	0.92	190
Novelty	0.366	0.359	0.133	0.077	0.795	190
Complementarity	0.617	0.639	0.174	0.000	0.972	190
Lock-In	0.454	0.463	0.140	0.167	0.763	190
Age of firm	7.0	4.3	7.8	0.4	45.8	190
Ln number of Employees	5.723	5.593	1.336	2.833	10.342	190
Country (1=US, 0=European Country)	0.88	1.00	0.32	0.00	1.00	190
R&D Expense USD 00 (million)	\$2.7	\$0.5	\$6.4	\$0.0	\$67.3	190
Advertising expense USD 00 (million)	\$4.7	\$1.0	\$9.3	\$0.0	\$52.8	190
Capital Expense USD 00 (million)	\$42.7	\$3.7	\$415.9	\$0.0	\$5,733.1	190
Book Value of Equity 99 (million)	\$163.7	\$57.3	\$416.6	-\$68.6	\$4,601.2	188
Book Value of Equity 00 (million)	\$272.8	\$71.2	\$685.2	-\$967.3	\$5,752.2	160
Sales Net USD 99 (million)	\$263.3	\$24.9	\$1,575.4	\$0.0	\$20,111.8	177
Sales Net USD 00 (million)	\$331.7	\$52.9	\$1,643.0	\$0.0	\$20,609.0	177
Number of Employees	1,067	269	3,557	17	31,000	190
Market Size USD 00 (million)	\$20,477	\$5,400	\$65,640	\$120	\$744,000	190

TABLE 3, Panel B: Pearson Correlation

Variable Name (Acronym)	Centered Efficiency	Centered Novelty	Interaction Centered Efficiency & Novelty	Complementarities	Lock-In	Competition	Log (market size)	Age	Log (employees)	Country	R&D EX 00	Adv. EX 00	Capital Ex. 00
Independent variables													
Centered efficiency	1.000												
Centered novelty	0.175*	1.000											
Interaction between centered efficiency & centered novelty	-0.057	-0.041	1.000										
Control variables													
Complementarity	0.349**	0.349**	-0.001	1.000									
Lock-In	0.316**	0.413**	-0.173*	0.373**	1.000								
Competition	-0.006	-0.322**	-0.147*	-0.128*	-0.121 [†]	1.000							
ln Market Size	-0.039	0.016	0.022	0.112	-0.062	0.097	1.000						
Age of firm	-0.112	-0.131 [†]	0.118	0.026*	-0.152*	0.048	0.214**	1.000					
ln number of Employees	0.004	-0.038	0.027	0.040	-0.028	-0.076	0.338**	0.452**	1.000				
Country	-0.074	0.168*	0.123 [†]	0.107	0.159*	0.097	0.462**	0.107	0.110	1.000			
R&D Expense 00	0.066	0.220**	0.049	0.088	0.140 [†]	-0.011	0.022	-0.027	0.281**	0.123 [†]	1.000		
Advertising expense 00	-0.088	0.020	0.037	0.042	0.002	0.027	0.199**	0.223**	0.493**	0.178*	0.434**	1.000	
Capital Expense 00	0.004	0.018	-0.004	0.147*	0.075	0.055	0.066	0.355**	0.271**	0.036	0.001*	0.414**	1.000

** p < 0.01, * 0.01 <= p < 0.05, [†] 0.05 <= p < 0.1

TABLE 4, Panel A: Mean centered OLS regression results (full sample)

RHS Variables	Dependent variable Ln (Market Value Quarter 4 Avg 99)			
	Model 1	Model 2	Model 3	Model 4
	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)
Constant	19.75***	17.25***	19.78***	17.51***
Efficiency	1.28 (1.09)	0.93 (0.90)	1.28 (1.09)	1.01 (0.90)
Novelty	3.32*** (0.93)	2.29** (0.83)	3.21*** (0.93)	2.17* (0.83)
Interaction Between Efficiency and Novelty Complementarities			-8.28 (7.63)	-9.16 (6.09)
Lock-In		-0.63		-0.59
Competition		0.80		0.51
Log (market size)		0.05		-0.08
Age		-0.16*		0-0.16*
Log (employees)		-0.05***		0-0.05***
Country		0.65***		0.64***
R&D expenditures 1999		0.12		0.20
Advertising exp. 1999		0.08**		0.09***
Capital exp. 1999		0.03		0.03
R-squared	0.10	0.52	0.11	0.53
Adjusted R-squared	0.09	0.48	0.09	0.49
F	8.47***	13.27***	6.04***	12.53***
N	158	158	158	158
Dependent variable Ln (Market Value Quarter 4 Avg 00)				
RHS Variables	Model 1	Model 2	Model 3	Model 4
	Estimate	Estimate	Estimate	Estimate
Constant	18.42***	16.36***	18.44***	16.64***
Efficiency	2.21 [†] (1.18)	2.44* (1.01)	2.16 [†] (1.10)	2.51* (1.01)
Novelty	1.72 [†] (1.01)	1.54 [†] (0.93)	1.70 [†] (1.01)	1.47 (0.93)
Interaction Between Efficiency and Novelty Complementarities			-8.24 (8.45)	-10.25 (6.83)
Lock-In		-0.71		-0.67
Competition		-0.30		-0.57
Log (market size)		0.88 [†]		-1.04*
Age		0.04		0.04
Log (employees)		-0.01		-0.01
Country		0.66***		0.65***
R&D expenditures 2000		-1.12**		-1.01**
Advertising exp. 2000		0.05**		0.05**
Capital exp. 2000		0.02		0.02
R-squared	0.04	0.47	0.05	0.48
Adjusted R-squared	0.03	0.44	0.03	0.44
F	3.84*	12.59***	2.88*	11.88***
N	180	180	180	180

***p<0.001, ** p <0.01, * 0.01<=p<0.05, † 0.05<=p<0.1

TABLE 4, Panel B: Summary of main regression results for different dependent variables

	INDEPENDENT VARIABLE	DEPENDENT VARIABLE	MODEL 1	MODEL 2	MODEL 3	MODEL 4
1999	Efficiency	Market Value Quarter 4 Close	1.70	1.35	1.70	1.44
		Market Value Quarter 4 Average	1.23	0.93	1.23	1.01
		Market Value Annual Average	1.25	0.89	1.25	0.96
2000	Efficiency	Market Value Quarter 4 Close	2.76*	3.16**	2.70*	3.26**
		Market Value Quarter 4 Average	2.19 [†]	2.44*	2.14 [†]	2.51*
		Market Value Annual Average	1.96*	1.82*	1.88 [†]	1.87*
1999	Novelty	Market Value Quarter 4 Close	3.44***	2.61**	3.34***	2.49**
		Market Value Quarter 4 Average	3.25***	2.29**	3.14***	2.17*
		Market Value Annual Average	2.70**	2.00*	2.62**	1.89*
2000	Novelty	Market Value Quarter 4 Close	1.28	1.77 [†]	1.23	1.66
		Market Value Quarter 4 Average	1.69 [†]	1.54 [†]	1.67 [†]	1.47
		Market Value Annual Average	2.33**	1.93*	2.30**	1.85*

***p<0.001, ** p <0.01, * 0.01<=p<0.05, † 0.05<=p<0.1

TABLE 4, Panel C: Mean centered OLS regression results (restricted sample)

RHS Variables	Dependent variable Ln (Market Value Quarter 4 Avg 99)			
	Model 1	Model 2	Model 3	Model 4
	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)
Constant	19.79***	17.25***	19.81***	17.50***
Efficiency	0.89 (1.12)	0.57 (0.93)	0.91 (1.12)	0.68 (0.93)
Novelty	3.56*** (0.97)	2.51** (0.87)	3.46*** (0.97)	2.40** (0.87)
Interaction Between Efficiency and Novelty			-6.34 (7.78)	-7.59 (6.18)
Complementarities		-0.35		-0.34
Lock-In		0.37		0.13
Competition		-0.03		-0.15
Log (market size)		-0.18*		-0.18*
Age		-0.05***		-0.05**
Log (employees)		0.69***		0.68***
Country		0.21		0.28
R&D expenditures 1999		0.08**		0.08**
Advertising exp. 1999		0.02		0.02
Capital exp. 1999		0.00		0.00
R-squared	0.11	0.54	0.11	0.55
Adjusted R-squared	0.09	0.5	0.09	0.5
F	8.25***	12.70***	5.71***	11.89***
N	142	142	142	142
Dependent variable Ln (Market Value Quarter 4 Avg 00)				
RHS Variables	Model 1	Model 2	Model 3	Model 4
	Estimate	Estimate	Estimate	Estimate
Constant	18.42***	15.95***	18.43***	16.16***
Efficiency	1.36 (1.32)	1.57 (1.09)	1.37 (1.32)	1.67 (1.09)
Novelty	2.97** (1.13)	2.83** (1.02)	2.93* (1.13)	2.74** (1.02)
Interaction Between Efficiency and Novelty			-2.39 (9.13)	-6.8 (7.17)
Complementarities		0.37		0.38
Lock-In		-2.04 [†]		-2.25*
Competition		-0.51		-0.61
Log (market size)		-0.03		-0.04
Age		-0.01		-0.01
Log (employees)		0.69***		0.68***
Country		-0.43		-0.36
R&D expenditures 2000		0.06**		0.06**
Advertising exp. 2000		0.02		0.02
Capital exp. 2000		0.00		0.00
R-squared	0.07	0.52	0.07	0.53
Adjusted R-squared	0.05	0.48	0.05	0.48
F	4.88**	11.74***	3.25**	10.90***
N	142	142	142	142

***p<0.001, ** p <0.01, * 0.01<=p<0.05, † 0.05<=p<0.1

TABLE 5: Chow test for structural break between 1999 and 2000

DEPENDENT VARIABLE	MODEL 1	MODEL 2	MODEL 3	MODEL 4
Market Value Quarter 4 Close	34.1**	14.92**	25.69**	14.06**
Market Value Quarter 4 Average	18.3**	9.1**	13.81**	8.6**
Market Value Annual Average	2.48 [†]	1.93*	1.95	1.87*

Table entries are F Statistics. ** p <0.01, * 0.01<=p<0.05, † 0.05<=p<0.1