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# Firm Survival Explained by Causation, Effectuation, and the Degree of Industry Dynamism

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**ABSTRACT**

This study analyses the relationship between the level of causation and effectuation as displayed in a firm's business plan and the survival data on those firms taking the level of industry dynamism into account. It is hypothesized that effectuation and its sub-dimensions lead to more firm survival than causation and that businesses operating in environments showing higher levels of industry dynamism increase their chances of survival when they employ an effectual entrepreneurial approach. To test this, data on causation, effectuation and firm survival was collected by coding 228 business plans. Data on industry dynamism was obtained from allocating each business plan into a specific NAICS sector and then calculating the uncertainty value (i.e. industry dynamism) for each sector according to Ensley et al. (2006). The findings indicate that effectuation and partially industry dynamism can indeed explain firm survival, but causation seems to not contribute to the explanatory value of the models. Furthermore, it was established that businesses operating in higher uncertainty do not employ more effectuation to begin with.

The general perception in literature that effectuation is the superior entrepreneurial approach under conditions of uncertainty can therefore be cautiously confirmed. Effectuation seems to be superior to causation, but additional conditions may mitigate the positive effect of effectuation. Objective uncertainty also contributes to the explanatory effect of firm survival – at least to a certain degree. Further research analyzing the effects of perceived environmental uncertainty in combination with objective uncertainty is required as well as a consideration of other factors affecting the start-up.

Contents

## 1. INTRODUCTION

Most research papers in the field of entrepreneurship are based on rational and goal-driven decision-making models as employed in neo-classical economics (Perry, 2012). Under this approach, termed causation, competitive advantage for emergent firms is achieved by searching for, discovering and exploiting opportunities that are within the control of the firm (Chandler & Jansen, 1992). Prediction plays a central role under this model in that it posits that through increased planning, an individual or firm is better positioned to predict the future, and can set themselves up to succeed (Wiltbank et al., 2009).

However, highly uncertain environments reduce both the accuracy and usefulness of prediction and call for a different approach to achieve a competitive advantage (Wiltbank et al., 2009; Gruber, 2007). In response to this, Sarasvathy introduced the concept of effectuation (2001) which is an alternative approach to new venture development. Effectuation is the paradigm of design rather than the paradigm of decision-making or discovery. It does neither require clear goals nor accurate predictions, but focuses on redrawing the problem space and on reconstituting existing realities into new opportunities (Dew et al., 2009). Under effectuation, control plays a central role and it is believed that by controlling the future, one does not need to predict it.

Conceptually, causation and effectuation have been the focus of a fairly large amount of research and the concept has been analysed and discussed from various angles. Yet, only little empirical research has been conducted to model and test effectuation (Perry et al., 2012). Another element that has not been analysed in the context of causation and effectuation is environmental uncertainty. It is commonly accepted in the management and entrepreneurship literature that firms operating in highly uncertain environments need to stay flexible to environmental dynamics to improve performance and to increase strategic advantage (Thanti, 2014). This notion is also a central part in effectuation theory which has stated repeatedly that effectuation is the more effective approach to venture planning in settings characterized by greater levels of uncertainty (Sarasvathy, 2001; Dew et al., 2008). Despite the importance and general acceptance of this concept among researchers, the actual influence of industry dynamism on the success of causation or effectuation strategies has not been tested empirically yet.

This paper will address both these issues and empirically test the relationship between entrepreneurial approach as displayed in a firm's business plan and firm survival taking into account the moderating effect of industry dynamism.

To measure the level of causation and effectuation displayed, each business plan was coded using a specific coding scheme designed to measure the sub-dimensions of causation and effectuation. To measure industry dynamism, a purely objective measure of the environmental uncertainty, each business plan was assigned to a NAICS sector and the industry dynamism present in each sector was calculated through a formula according to Ensley et al. (2006), making use of regression coefficients. The results indicate that effectuation is indeed the more effective entrepreneurial approach for realizing firm survival, but there seems to be only a partial explanatory value of industry dynamism. Additional research into a more subjective measure of environmental uncertainty as well as into additional mitigating factors is required to gain more specific insights into the relationship between entrepreneurial approach, industry uncertainty and firm performance.

## 2. LITERATURE REVIEW

### 2.1 Effectuation as a One-Dimensional Construct

The traditional model of entrepreneurship draws largely on economic thinking to describe how an individual or firm takes entrepreneurial action. Under this model, the entrepreneur follows a linear process of discovery, evaluation and exploitation of opportunities which in turn lead to further planning activities (Shane and Venkataraman, 2000). This approach is termed causal reasoning and is based on the logic that, "to the extent [to which] we can predict the future we can control it" (Sarasvathy, 2001, p. 251). Causation has its roots in decision theory (Simon, 1959 In: Fisher, 2012) which posits that "if decision makers believe they are dealing with a measurable or relatively predictable future, they will tend to do some systematic information gathering and analysis within certain bounds" (Sarasvathy, 2001, p.252). Under causation, the entrepreneur first decides on a pre-determined goal and then selects between different means to achieve that goal (Sarasvathy, 2001).

However, since entrepreneurial environments are often highly dynamic, ambiguous and unpredictable, there is sometimes not enough information for entrepreneurs to discover and

evaluate opportunities prior to exploitation (Fisher, 2012). Sarasvathy addresses this issue in her paper (2001) and developed the concept of effectuation as an explanation for entrepreneurial activities under such conditions.

Effectuation is a logic of design rather than that of decision or discovery in that it contains a consistent set of ideas that forms a clear basis for action upon the world. Effectuation does not assume pre-determined goals. Instead, goals emerge from negotiations with stakeholders and in the process frequently transform into new goals. Further, effectuation reframes the initial set of opportunities the firm had intended to exploit and explicitly reshapes the environment the firm operates in. In short: effectuation is non-predictive in the sense that it does neither require accurate predictions, nor clear goals or an adaptive stance towards an exogenous environment (Dew et al., 2008).

The two approaches can be contrasted as follows: Causal logic argues that better predictions lead to better control over outcomes ("to the extent we can predict the future, we do not need to control it") while effectual logic is based upon the premise that to the extent each relevant stakeholder controls elements of the environment, investments in prediction are unnecessary ("to the extent we can control the future, we do not need to predict it") (Sarasvathy, 2001, p. 252). The boundary condition for the causational strategy to be applicable is that the market for the product or service needs to be existent prior to exploitation. The pre-requisite for effectuation to be useful is a dynamic and nonlinear environment where the future is unknown and therefore not predictable (Fisher, 2012). Table 1 shows the main categories of differentiation of the two theories.

**Table 1**

**Contrasting causation and effectuation (adapted from Sarasvathy, 2001)**

| Categories of Differentiation | Causation Processes | Effectuation Processes |
|---|---|---|
| Givens | Effect is given | Only some means or tools are given |
| Decision-making selection criteria | Help choose between means to achieve the given effect | Help choose between possible effects that can be created with given means |
| | Selection criteria based on expected return | Selection criteria based on affordable loss or acceptable risk |
| | Effect dependent: Choice of mean is driven by characteristics of the effect the decision maker wants to create and his or her knowledge of possible means | Actor dependent: Given specific means, choice of effect is driven by characteristics of the actor and his or her ability to discover and use contingencies |
| Competencies employed | Excellent at exploiting knowledge | Excellent at exploiting contingencies |

| | | |
|---|---|---|
| Context of relevance | More ubiquitous in nature | More ubiquitous in human action |
| | Most useful in static, linear and independent environments | Explicit assumption of dynamic, nonlinear, and ecological environments |
| Nature of unknowns | Focus on the predictable aspects of an uncertain future | Focus on the controllable aspects of an unpredictable future |
| Underlying logic | To the extent we can predict the future, we can control it | To the extent we can control the future, we do not need to predict it |
| Outcomes | Market share in existent markets through competitive strategies | New markets created through alliances and other cooperative strategies |

Sarasvathy (2001) does not claim that effectuation is inherently superior to causation when it comes to performance, but postulates that it is likely to be more efficient in settings governed by higher levels of risk and uncertainty. Especially the finding that expert entrepreneurs use effectuation significantly more often than less experienced MBA students supports this tendency (Sarasvathy, 2001).

Which entrepreneurial approach promises the higher positive benefits therefore depends on the situation. Research on business planning points in the same direction. According to Gruber (2007), the value received from planning is largely dependent on three circumstances: the type of founding environment, the type of activities pursued in planning and the effort devoted to specific activities. The greatest benefits from planning can be derived in stable environments as entrepreneurs know what to plan for. In uncertain environments where the outcome is unpredictable, a more flexible approach and planning in a trade-off manner is more successful. (Gruber, 2007; Wiltbank, 2006).

### 2.2 Effectuation as a Multi-Dimensional Construct

While effectuation can be seen as one construct, Chandler et al. (2011) states that it is in fact a multidimensional construct. The four sub-constructs that effectuation is made of serve not only in understanding the concept of effectuation better, but also can be contrasted with the causational constructs to highlight in what areas the two theories differ. Each dimension can be considered as a dichotomous variable with effectuation on one end of the continuum, and causation on the other end, respectively. All effectual sides of the dimensions are designed to maximize the ability to control the future, all causational sides are designed to maximize prediction accuracy of the future.

1. *Means-driven as opposed to goal-driven*

Under effectuation, an individual or firm begins with a given set of means and focuses on generating new ends. Under causation, an individual or firm begins with selecting a goal and then chooses among existing means to achieve this goal.

2. *Affordable loss as opposed to expected return*

   Effectual logic prescribes that the decisions are made based on the entrepreneur's assessment of what they are willing to lose. This means that decision-makers focus on projects where, should a loss happen, this is affordable to them. Causational logic, on the other hand, is driven by the desire to maximize the expected return.

3. *Partnerships as opposed to competitive analysis*

   An effectual entrepreneur favors pre-commitments and brings stakeholders into the equation as early into a project as possible. This often happens before a venture has even been created. As a result, the stakeholders take part in forming the venture and giving it a direction. In contrast, causal entrepreneurs start with defining and analyzing the market through detailed competitive analyses and only after that make decisions on which stakeholders to pursue.

4. *Leveraging contingencies as opposed to avoiding contingencies*

   Under effectuation, an entrepreneur is prepared to leverage both positive and negative contingencies and is adaptive enough to transform them into useful elements of new opportunities. They exploit opportunities by remaining flexible. Causational entrepreneurs try to avoid all sorts of surprises, irrespective of whether they are positive or negative, and focus on exploiting pre-existing opportunities instead.

   (Sarasvathy, 2001; Dew et al., 2009; Chandler et al., 2011).

**Table 2**

**Fundamental differences between causational and effectual thought -adapted from Read et al. (2009)**

| Issue | Predictive Approach | Effectual Approach |
|---|---|---|
| View of the future | Predictive: Predictive logic casts the future as a continuation of the past. Accurate prediction is both necessary and useful. | Creative: The future is co-created (at least in part) by willful agents which may include investors, partners, and customers who "precommit" to the venture |
| Basis for taking action | Goal-oriented: Goals, even when constrained by limited means, determine subgoals and actions. | Means-oriented: Goals emerge by imagining courses of action that begin from available means. |
| View of risks and resources | Expected return: Pursue new opportunities based on the (risk-adjusted) expected value. The focus is on the upside potential. | Affordable loss: Pursue satisfactory opportunities without investing more resources than stakeholder can afford to lose. Limit downside potential. |
| Attitude toward outsiders | Competitive analysis: Protect what you have and maximize your share of the opportunity. | Partnerships: Share what you have with committed partners because relationships (particularly with shared rewards) shape the trajectory of the opportunity. |

| | | |
|---|---|---|
| Attitude toward unexpected events | Avoid: Surprise is bad. Prediction, planning, and focus enable the firm to minimize the impact of unexpected events. | Leverage: Surprise is good. Imaginative rethinking of possibilities transforms the unexpected into new opportunities. |

Conceptually, Sarasvathy (2001) clearly opposes causation and effectuation and their dimensions on opposite ends of a dichotomous scale and describes effectuation as being the inverse of causation but concedes that, empirically, both approaches can occur at the same time. More recent studies support this statement by arguing that causation and effectuation are orthogonal rather than on opposite ends of a continuum (Wiltbank, 2009; Chandler et al., 2011; Appelhoff, 2015).

### 2.3 Environmental Uncertainty

In general, uncertainty is the inability to predict the future and arises when decision makers are unable to forecast future events based on the information at hand (Anderson, 2001). Environmental uncertainty is currently one of the most important research areas in management and entrepreneurship literature (Verdu et al., 2012) and places a direct impact on start-up firms (Ghosh et al., 2014). This relationship between uncertainty and the success of start-ups has already been a vital element in Schumpeter's (1974; In Ghosh, 2014) idea of stressed innovation with uncertainty as discussed by Knight (1921) and Brouwer (2000). Environmental uncertainty has its roots in (1) contingency theory (March and Simon, 1958; Lawrence and Lorsch, 1967) which deals with interpreting the environment and with fitting the organization to the environment and in (2) perceptual theory (Duncan, 1972; Child, 1972) which relates uncertainty to the interpretation of the environment and to accessing its real meaning (Ghosh et al., 2014).

The concept of environmental uncertainty has multiple definitions in the literature such as the unknown probability of outcome (Knight, 1921), a lack of information about environmental components necessary for decision-making (Duncan, 1972) and an individual's perceived inability to accurately predict an organization's environment (York & Venkataraman, 2010). Overall environmental uncertainty is a combination of objective measures and subjective perceptions. Objective uncertainty is the uncertainty that results from a variability in the environment which cannot be reduced through additional investigation. Subjective uncertainty corresponds to scientific ignorance, uncertainty in measurement or other forms of knowledge deficiency (Campos et al., 2007).

Objective uncertainty, therefore, describes the state of the organizational environment in terms of how objectively uncertain it is (Milliken, 1987). It equates to industry dynamism, which McKelvie (2011) defines as an objective, external factor contributing to uncertainty. Ensley et al. (2006) supports this definition by characterizing dynamic environments as rapidly changing, unpredictable environments which increase uncertainty for both individuals and firms operating within them (Dess and Beard, 1984). Subjective uncertainty, on the other hand, describes the state of a person who perceives himself/herself to be lacking critical information about the environment. Uncertainty thus lies in the eye of the beholder and is considered a perceptual phenomenon (Milliken, 1987).

There is no consensus yet on the significant effects of objective and perceived environments on firm performance, but it is believed that perception mediated between the objective environment and decision-making to make meaning of the environment and to take the necessary actions (Terborg, 1981; Jauch & Kraft, 1986; Milliken, 1987; In Ghosh et al., 2014).

### 2.4 Uncertainty and Effectuation

Uncertainty not only affects entrepreneurial decision-making (Ghosh 2014), it is also the key environmental dimension associated with organizational mortality (Anderson, 2001). A lot of research has dealt with conceptualizing and analyzing uncertainty in itself (Milliken, 1987; Jansen et al., 2009; McKelvie, 2011; Thanti, 2014) as well as in relation to different entrepreneurial strategies. Uncertainty has been at the center of studies on homogeneous and heterogeneous top management teams (Ensley et al., 2006), planning vs. no-planning strategies (Gruber, 2007) and transactional vs. transformational leadership (Jansen et al., 2009). The results from these studies suggest that highly uncertain environments require a flexible, adaptive management approach, which goes in line with effectuation theory. Sarasvathy (2001) states that effectual logic is likely to be more effective in environments characterized by greater levels of uncertainty and Dew et al. (2008) claims that effectuation does not need a predictive stance to properly respond to a largely exogenous environment.

## 3. HYPOTHESES

The majority of research suggests that effectuation leads to better firm performance in uncertain environments. Empirical research is scarce and this paper focuses on empirical data

to answer the question. The question this paper can attempt to answer is: Does effectuation in objectively uncertain (i.e. dynamic) environments lead to more firm survival? In other words, it constitutes an attempt to quantitatively assess the explanatory value of effectuation, causation and industry dynamism for firm survival.

The world is defined by constant opportunity and change. This situation is even exacerbated for entrepreneurs who, by definition, have to solve unique problems (Hmieleski et al., 2008) and are subject to the liability of newness (Gao et al.; 2010). The difficulty of this situation is evidenced by the consistently high failure rates of start-ups across all industries and various periods of time (Gao et al., 2010). Effectuation appears to be a reasonable solution to these problems facing new ventures. It is means-driven rather than goal-driven and thus flexible in applying the limited available resources as efficiently as possible while also focusing on keeping losses to a minimum. It effectively balances the resource constraints by building a strong network of partners and by trying to co-create the future rather than wasting resources on prediction logic (Gabrielsson et al., 2013; Read, Dew, et al., 2009). Effectuation can manage crises effectively and create more successful firms in the process (Sarasvathy, 2001). The resulting hypothesis is:

***Hypothesis 1a: New ventures applying an effectuation approach are more likely to survive than new ventures applying a causation approach.***

Effectuation attempts to co-create the future rather than wasting the limited resources on prediction logic (Gabrielsson et al., 2013). It can thus shape the future rather than simply react to it and allocate the limited resources to other areas where they are needed more urgently.

***Hypothesis 1b – sub-dimension "non-predictive control": New ventures focusing on non-predictive control are more likely to survive than those focusing on predictive control.***

Effectuation is means-oriented rather than goal-oriented and therefore imagines courses of actions and goals that can be achieved with the available means (Read, Dew, et al., 2009). Since new ventures are usually subject to significant resource constraints (Gabrielsson et al., 2013), beginning with the available means appears to be a good starting point for setting realistic future goals.

***Hypothesis 1b – sub-dimension "means-orientation": New ventures that are more means-oriented are more likely to survive than those that are more ends-oriented***

Ventures employing effectuation focus on limiting downside potential by pursuing satisfactory opportunities without investing more resources than they can afford to lose. Ventures employing causation, on the other hand, focus on the upside potential with the main goal of maximizing profits (Read et al., 2009). The former approach implies that effectual entrepreneurs exert generally more caution when deciding on potential opportunities than their causational counterparts and are therefore more perceptive to potential red flags. At the same time, they are more reluctant to make large investments that could potentially impact their survival.

***Hypothesis 1b – sub-dimension "affordable loss": New ventures placing a high emphasis on affordable loss are more likely to survive than those placing a high emphasis on expected return.***

Rather than investing scarce resources on analyzing and monitoring competitors to stay ahead of them, effectual entrepreneurs try to build a strong network of partners (Read et al., 2009). In doing so, they can not only effectively manage their limited resources by tapping into their partners resource pool, but are also in a good position to shape the future together with these partners rather than simply reacting to it.

***Hypothesis 1b – sub-dimension "partnerships": New ventures that focus more on building partnerships are more likely to survive than those focusing more on competitive analysis.***

New ventures are naturally exposed to certain levels of uncertainty (Mc Kelvie et al., 2011). At the same time, uncertainty is the key environmental dimension concurrent with organizational mortality (Anderson, 2001). This leads to the following hypothesis:

***Hypothesis 2: Higher levels of industry dynamism negatively affect firm survival.***

Due to the fact that new ventures are naturally exposed to certain levels of uncertainty (Mc Kelvie et al., 2011) as well as to the belief that effectuation is considered to be an effective means for coping with uncertainty (Sarasvathy, 2001), it can be expected that new ventures with a desire to survive express more effectual behavior.

***Hypothesis 3: More industry dynamism leads to firms applying more effectuation.***

Sarasvathy (2001) noted early on that effectuation is more useful in dynamic and nonlinear environments. This notion has frequently reappeared in literature in the following years. It has been established that an uncertain environment requires planning in a trade-off

manner (Gruber, 2007), that heterogeneous management teams outperform homogeneous teams in dynamic environments (Ensley et al., 2006) and that uncertain environments require firms to stay flexible to industry dynamics (Thanti, 2014). Combining these arguments leads to the following hypothesis.

***Hypothesis 4a: The relationship between effectuation and firm survival is positively moderated by industry dynamism. The greater the industry's dynamism, the stronger the positive effect of effectuation on firm survival.***

Applying the same reasoning as for hypothesis 1a-1d as well as the arguments for hypothesis 4 result in these hypotheses for the sub-dimensions of effectuation.

***Hypothesis 4b – sub-dimension "non-predictive control": The relationship between non-predictive control and firm survival is positively moderated by industry dynamism. The greater the industry's dynamism, the stronger the positive effect of non-predictive control on firm survival.***

***Hypothesis 4b - sub-dimension "means-orientation": The relationship between means-orientation and firm survival is positively moderated by industry dynamism. The greater the industry's dynamism, the stronger the positive effect of means-orientation on firm survival.***

***Hypothesis 4b - sub-dimension "affordable loss": The relationship between affordable loss and firm survival is positively moderated by industry dynamism. The greater the industry's dynamism, the stronger the positive effect of affordable loss on firm survival.***

***Hypothesis 4b – sub-dimension "partnerships": The relationship between seeking partnerships and firm survival is positively moderated by industry dynamism. The greater the industry's dynamism, the stronger the positive effect of seeking partnerships on firm survival.***

## 4. METHOD

### 4.1 Data Collection

The business plans for the main dataset were collected from the Business Plan Archive (http://www.businessplanarchive.org), a research database which contains information on approximately 3000 companies. The selection of the business plans used for this study was

based on purposive sampling and only those business plans that contained information on the required variables were selected. Those business plans that did not contain information on multiple variables were omitted (Oude Luttikhuis, 2014). Of the initially coded 414 business plans, 228 business plans were eventually used for the main analysis. Inclusion criteria were that the survival data at 2004 and at 2014 had to be available, founding date and date of business plan submission had to be between 1990 and 2004. An exclusion criterion was that no more than 10 missing values were permitted. Data on industry dynamism was collected via official U.S. databases (Bureau of Labor Statistics, United States Census Bureau, U.S. Bureau of Economic Analysis and the U.S. National Science Foundation). These databases contain detailed historic as well as current information and statistics on all U.S. industries (Appendix B). Missing values were excluded case-wise within each analysis.

### 4.2 Measure of Firm Performance

Firm survival was used as the dependent variable to measure firm performance. The data on firm survival reflects whether a firm was still in business in the year 2004 and the year 2014, respectively. Firm survival was chosen over other performance measures for two reasons. New firms are facing high uncertainty and are therefore required to focus on establishing their market positions and building their business. This is especially true for firms operating in emerging industries where they often have to invest heavily to reach and educate customers about their products (Porter, 1980). As a consequence, profitability may not be a good indicator of performance in the first years of business (Baum et al., 2001; Mudambi et al., 2007). Moreover, empirical evidence exists that supports a positive relationship between a firm's survival data and its later market share and profit performance (Evans, 1987a,b). Nonetheless, data on additional dependent variables such as mergers and acquisitions was collected as well.

### 4.3 Coding Business Plans on Effectuation & Causation

All business plans were coded using a coding scheme specifically developed for this research project. The coding scheme contains a total of 29 codes which were designed to measure certain indicators of each sub-dimension of causation and effectuation. 3 different types of measurement were chosen for the coding to best capture the underlying nature of the business plans, namely binary (i.e. yes/no), ordinal 5-point Likert scale ranging, and frequency.

**Table 3**

**Coding scheme (adapted from Oude Luttikhuis, 2014)**

| Sub-dimension | Variable | Unit of Measurement |
|---|---|---|
| | Name of the company | Qualitative |
| | Names of the entrepreneurs | Qualitative |
| | Founding date | Date |
| | Date of business plan | Date |
| | Team size | Quantitative; amount of team members |
| Predictive Control | Business plan pages | Quantitative; number of pages |
| | Market analysis pages | Quantitative; number of pages |
| | Assumptions | Quantitative; 5 point Likert scale |
| | Market analysis complexity | Quantitative; 5 point Likert scale |
| | Marketing tables & figures | Quantitative; number of tables and figures |
| | Number of instances of obligations, necessities & duties | Quantitative; word count of verbs *have to, must* and *should* |
| Non-Predictive Control | New markets | yes/no |
| | Age at the time of writing | Quantitative; number of years between founding date and writing of business plan |
| | New products | Quantitative; number of new products described in business plan |
| | Past actions | 5 point Likert scale: extent of already completed business development activities |
| Ends-Oriented | Growth orientation | 5 point Likert scale; extent to which the firm intends to grow over the next few years (e.g. in terms of revenue growth or employee growth) |
| | Market share | yes/no; has an intended market share been given |
| Means-Oriented | Members advisory board | Quantitative; amount of members on advisory board |
| | Start-up experience | Quantitative; number of ventures previously started by founders |
| | Entrepreneurial team business competencies | Quantitative; number of university degrees of team members in business related studies |
| | Entrepreneurial team technical competencies | Quantitative; number of university degrees of team members in technical studies |
| | Number of instances of theoretical possibilities | Quantitative; word count of word, *can, could, may* and *might* |
| | Fit with previous experience | 5 point Likert scale; extent to which previous experience of management team fits this new venture |
| Expected Return | Market segmentation | Quantitative; number of market segments targeted in business plan |
| | Projected years | Quantitative; number of years of financial projections |
| | Selected strategy | 5 point Likert scale; extent to which strategy has been described |
| | Precision of financial projections | 5 point Likert scale |
| Affordable Loss | Required start-up capital | Quantitative; amount of US dollars requested in business plan |
| | Risks | 5 point Likert scale; extent of risk analysis |
| Competitive Analysis | Pages on competitive analysis | Quantitative; number of pages on competitors |
| | Amount of competitors | Quantitative; number of competitors mentioned in business plan |
| Seeking Partnerships | Amount of partnerships | Quantitative; number of already established partnerships given in business plans |
| | Pages on partnerships | Quantitative; number of pages on partnerships |
| | Openness to potential partnerships | 5 point Likert scale |
| Control Variables | Team experience | 5 point Likert scale |

The complete coding scheme with additional information about the coding procedure is attached in Appendix A.

The dataset was generated by two independent raters working according to the coding scheme. The reliability of the coding procedure was checked by first having both raters code a random sample of 35 business plans individually and then comparing results via Cohen's Kappa. Fleiss' (1981) Kappa Benchmark was applied for labeling the Kappa values into poor, intermediate to good, and excellent strength of agreement (Appendix B).

**Table 4**

**Fleiss' Kappa benchmark scale**

| Kappa Value | Strength of Agreement |
|---|---|
| < 0.40 | Poor |
| 0.40 - 0.75 | Intermediate to good |
| > 0.75 | Excellent |

Fourteen codes showed an excellent strength of agreement, twelve an intermediate to good strength of agreement and four codes ("*market analysis pages", "pages on partnerships", "number of instances of theoretical possibilities"* and *"fit with previous experience"*) showed poor strength of agreement with Kappa statistics below 0.40. The first three codes were measured by counting pages or the number of instances of certain word occurrences and thus resulted in natural differences, even if only by half a page or one count. The code "*fit with previous experience*" is a 5 point Likert scale measure of the degree to which a business plan fits the previous experience of the founding team. The fact that the measure is rather subjective in nature prevents a high strength of agreement. Furthermore, the Kappa value is 0.38 and thus almost in the intermediate range. Consequently none of the four codes were excluded from further analyses. After an acceptable inter-rater reliability was achieved, the complete dataset of 414 business plans was split among the two raters and coded completely. In a second stage, data was cross-checked to increase reliability of the results.

To build the measure for effectuation, first the means of the four sub-dimensions are calculated by averaging the standardized codes belonging to each sub-dimension and then making a mean out of these means. The mean for the four sub-dimensions of effectuation displayed a Cronbach's alpha of .43. Although this Cronbach's alpha is under an acceptable threshold of .60, this indication of lacking internal reliability is ignored to follow the original calculations of the effectuation measure. To build the measure for causation, the same procedure was utilized. First, means of the standardized codes belonging to each sub-dimension were calculated. Second, the means of the sub-dimensions are then averaged to

arrive at a mean for causation. The mean for the four sub-dimensions of causation displayed a Cronbach's alpha of .60.

### 4.4 Industry Dynamism

Industry dynamism was calculated according to the formula proposed by Ensley et al. (2006). Dynamism was chosen over uncertainty because it allows for an objective measure of the uncertainty that is present in the environment without having to adjust for subjective differences in perceptions. First, each individual business plan was assigned a specific 6-digit NAICS code that most closely matched its core business activity. Each 6-digit code (industry level) was then grouped into their respective 2-digit NAICS code (sector level), resulting in the following distribution

**Table 5**

**NAICS sector frequency distribution**

| 2 digit NAICS sector | Industry Title | Frequency Of Occurrence |
|---|---|---|
| 11 | Agriculture, Forestry, Fishing and Hunting | 0 |
| 21 | Mining | 0 |
| 22 | Utilities | 0 |
| 23 | Construction | 2 |
| 31-33 | Manufacturing | 12 |
| 42 | Wholesale Trade | 0 |
| 44-45 | Retail Trade | 19 |
| 48-49 | Transportation and Warehousing | 3 |
| 51 | Information | 97 |
| 52 | Finance and Insurance | 11 |
| 53 | Real Estate Rental and Leasing | 4 |
| 54 | Professional, Scientific, and Technical Services | 58 |
| 55 | Management of Companies and Entrepreneurs | 0 |
| 56 | Administrative and Support and Waste Management and Remediation Services | 7 |
| 61 | Educational Services | 5 |
| 62 | Health Care and Social Assistance | 3 |
| 71 | Arts, Entertainment, and Recreation | 1 |
| 72 | Accommodation and Food Services | 1 |
| 81 | Other Services (except Public Administration) | 3 |
| 92 | Public Administration | 0 |

Data was collected on the number of employees, the number of establishments, the added value (industry revenues in original paper), and research and development intensity for the time span 1998 – 2013. For each of these variables regression slopes for the time spans 1998 – 2004, 2005 – 2013, and 1998 – 2013 were calculated. The standard error of the

regressions was then divided by the mean of the respective variable that the regression was calculated with, yielding measures of instability. The sum of the instability measures of the number of employees, the number of establishments, the added value was standardized and added to the standardized instability measure of research and development intensity and added the number of years within the respective time span to yield the industry dynamism for the respective time span.

$$\text{Industry Dynamism}_{1998-2004} = Z(NEI + MI + NESTI) + Z(TI) + 7$$

$$\text{Industry Dynamism}_{2005-2013} = Z(NEI + MI + NESTI) + Z(TI) + 9$$

$$\text{Industry Dynamism}_{1998-2013} = Z(NEI + MI + NESTI) + Z(TI) + 16$$

Where Z() = z-score of terms within parentheses, MI = market instability, NEI = number of employees instability, NESTI = number of establishments instability, TI = technological instability.

### 4.5 Analyses

All calculations and analyses were conducted via SPSS, version 23. To determine statistical significance, an alpha of .05 was handled for all statistical tests. To determine trends, an alpha of .10 was adopted.

To test the first hypothesis whether effectuation leads to more firm survival four binary logistic regression analyses were conducted with firm survival at 2004 (model 1.1a) and 2014 (model 1.2a) as the dependent variables and the aggregate scores of effectuation and causation as the independent variables. This was repeated with the sub-dimensions of effectuation and causation as independent variables (model 1.1b and 1.2b).

To test the second hypothesis whether high industry dynamism leads to lower firm survival three binary logistic regression analyses were conducted. Model 2.1 tests firm survival at 2004 as the dependent variable and industry dynamism of 1998 – 2004 as the independent variable, Model 2.2 tests firm survival at 2014 as the dependent variable and industry dynamism of 2005 – 2013 as the independent variable, and Model 2.3 tests firm survival at 2014 as the dependent variable and industry dynamism of 1998 – 2013 as the independent variable.

To test the third hypothesis whether more industry dynamism induces more effectuation two OLS regression analyses were conducted with the aggregate scores for effectuation (model 3.1) and causation (model 3.2) as dependent variables and industry dynamism at 1998 – 2013 as the independent variable.

To test the fourth hypothesis whether effectuation and industry dynamism lead to more firm survival three binary logistic regression analyses were conducted. Model 4.1a tests with firm survival at 2004 as the dependent variables and the aggregate scores of effectuation and causation, and industry dynamism at 1998 – 2004 as the independent variables, model 4.2a tests with firm survival at 2014 as the dependent variables and the aggregate scores of effectuation and causation, and industry dynamism at 2005 – 2013 as the independent variables, and model 4.3a tests with firm survival at 2004 as the dependent variables and the aggregate scores of effectuation and causation, and industry dynamism at 1998 – 2013 as the independent variables. Model 4.1b through model 4.3b repeated these analyses with the sub-dimensions of effectuation and causation instead of their aggregate scores.

## 5. RESULTS

### 5.1 Descriptives

The formula for calculating industry dynamism includes the span of years that the measure is aimed at. In other words, industry dynamism is a measure that increases 1 per year, by default. The time spans of the industry dynamism of 1998 - 2004 and 2005 - 2013 are approximately equal to each other (i.e. 7 and 9 years). In contrast, the industry dynamism of 1998 - 2013 spans 16 years. This explains partly the differences between the two short time spans of 1998 - 2004 and 2005 - 2013 and the long time span of 1998 - 2013 (Table 7). Other fluctuations in industry dynamism are due to changes in industry establishment, industry employees, value added, and research and developmental intensity.
There is a statistically significant positive correlation between effectuation and causation. The more effectuation is found within a business plan, the more causation is found therein also. There is no statistically significant correlation between industry dynamism and either effectuation or causation. There is a statistically significant positive correlation between the long time span and the short time spans, but a statistically significant negative correlation between the short times spans.

**Table 6**

**Descriptives and bivariate correlations for effectuation, causation and industry dynamism**

| | | | N | Minimum | Maximum | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Effectuation | (aggregate) | 227 | -1.52 | 1.85 | -0.01 | 0.49 | | | | | | | | | | | | |
| 2 | | Afford loss | 228 | -.78 | 3.47 | -0.01 | 0.82 | .25** | | | | | | | | | | | |
| 3 | | Partners | 228 | -1.18 | 4.26 | 0.00 | 0.74 | .20** | .14* | | | | | | | | | | |
| 4 | | Means | 218 | -.87 | 2.38 | 0.00 | 0.49 | .30** | .29** | .26** | | | | | | | | | |
| 5 | | Non-predictive | 228 | -.85 | 3.20 | 0.00 | 0.49 | -.11 | .10 | .12 | .16* | | | | | | | | |
| 6 | Causation | (aggregate) | 228 | -.74 | 1.53 | 0.00 | 0.40 | .28** | .70** | .66** | .63** | .47** | | | | | | | |
| 7 | | Expected returns | 226 | -1.78 | 2.22 | 0.00 | 0.65 | .66** | .23** | .28** | .26** | .07 | .35** | | | | | | |
| 8 | | Competition | 228 | -.99 | 4.57 | 0.00 | 0.85 | .65** | .13* | .09 | .16* | -.19** | .10 | .11 | | | | | |
| 9 | | Ends | 228 | -2.31 | 1.71 | -0.02 | 0.75 | .67** | .12 | .02 | .19** | -.08 | .10 | .33** | .10 | | | | |
| 10 | | Predictive | 70 | -1.03 | 2.06 | 0.00 | 0.65 | .71** | .32** | .42** | .43** | .14 | .50** | .54** | .27* | .19 | | | |
| 11 | Industry Dynamism | 1998 - 2004 | 226 | 5.46 | 10.11 | 7.72 | 1.35 | -.09 | -.01 | .10 | .08 | -.07 | .05 | .01 | -.14* | -.03 | .00 | | |
| 12 | | 2005 - 2013 | 226 | 7.52 | 11.64 | 8.30 | 0.75 | .05 | -.11 | -.04 | .03 | .06 | -.05 | -.04 | .11 | .00 | .02 | -.21** | |
| 13 | | 1998 - 2013 | 226 | 14.85 | 18.82 | 15.71 | 0.63 | .01 | -.08 | .06 | .04 | -.05 | -.01 | -.01 | .02 | .00 | .07 | .46** | .69** |

* $p < .05$, ** $p < .01$, + $p < .10$

**Table 7**

**Industry dynamism for all sectors (2 digit NAICS) and over both short time spans and the long time span**

| NAICS sector (2-digit) | | 23 | 31 | 32 | 33 | 44 | 45 | 48 | 49 | 51 |
|---|---|---|---|---|---|---|---|---|---|---|
| Industry Dynamism | 1998 - 2004 | 6.69 | 6.41 | 6.41 | 6.41 | 5.46 | 5.46 | 10.11 | 10.11 | 9.10 |
| | 2005 - 2013 | 10.01 | 8.54 | 8.54 | 8.54 | 8.30 | 8.30 | 11.64 | 11.64 | 7.84 |
| | 1998 - 2013 | 16.87 | 14.92 | 14.92 | 14.92 | 15.27 | 15.27 | 18.49 | 18.49 | 15.85 |
| N | | 2 | 1 | 3 | 8 | 4 | 15 | 1 | 2 | 97 |
| NAICS sector (2-digit) | | 52 | 53 | 54 | 56 | 61 | 62 | 71 | 72 | 81 |
| Industry Dynamism | 1998 - 2004 | 7.18 | 6.67 | 6.81 | 8.05 | 6.04 | 5.95 | 7.26 | 6.29 | 6.34 |
| | 2005 - 2013 | 10.30 | 9.25 | 8.27 | 9.53 | 8.04 | 7.52 | 8.42 | 8.58 | 7.89 |
| | 1998 - 2013 | 17.13 | 16.95 | 15.31 | 16.19 | 15.19 | 14.85 | 15.74 | 15.45 | 15.27 |
| N | | 11 | 4 | 58 | 7 | 5 | 3 | 1 | 1 | 3 |

## 5.2 Hypothesis 1

To determine whether firm survival can be explained by effectuation and causation, several models were tested with binary logistic regression (Table 8 and 9). Model 1.1a tests whether effectuation and causation can explain firm survival on 2004. The binary logistic regression is marginally significant ($\chi^2_{(2)} = 5.32$; $p < .10$). Within Model 1.1a effectuation displays a statistically significant positive incline parameter for the chance of survival on 2004 ($B = 0.63$ $SE_B = 0.29$; $Wald_{(1)} = 4.60$; $p < .05$). Causation did not display a statistically significant incline parameter. The hypothesis is supported as effectuation can explain firm survival on 2004, causation cannot.

Model 1.2a tests whether effectuation and causation can explain firm survival on 2014. The binary logistic regression is marginally significant ($\chi^2_{(2)} = 5.37$; $p < .10$). Within model 1.2a effectuation displays a statistically significant positive incline parameter for the chance of survival on 2014 ($B = 0.76$; $SE_B = 0.35$; $Wald(1) = 4.76$; $p < .05$). Causation did not display a statistically significant incline parameter ($B = 0.02$; $SE_B = 0.41$; $Wald(1) = 0.00$; $p = .97$). The hypothesis is supported as effectuation can explain firm survival on 2014, causation cannot.

**Table 8**

**Binary logistic regressions for firm survival explained by effectuation and causation**

| | Model 1.1a: survival 2004 | | | Model 1.2a: survival 2014 | | |
|---|---|---|---|---|---|---|
| | B ($SE_B$) | Wald | P | B ($SE_B$) | Wald | P |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Effectuation | **0.63(0.29)** | **4.60** | **.03** | **0.76(0.35)** | **4.76** | **0.03** |
| Causation | 0.04(0.35) | 0.01 | .92 | 0.02(0.41) | 0.00 | 0.97 |
| | $\chi^2$ | df | $R^2$ | p | $\chi^2$ | df | $R^2$ | p |
| | **5.32** | **2** | **0.03** | **.07** | **5.37** | **2** | **0.04** | **0.07** |

$^{*}$ p < .05, $^{**}$ p < .01, $^{+}$ p < .10

To determine whether firm survival can be explained by the sub-dimensions of effectuation and causation, several models were tested with binary logistic regression (Table 9). Model 1.1b tests whether the sub-dimensions of effectuation and causation can explain firm survival on 2004. The binary logistic regression is not significant ($\chi^2_{(8)} = 2.70$; p = .95). Further analyses on this model are omitted. The hypothesis is not supported as the model with the sub-dimensions cannot explain firm survival on 2004.

Model 1.2b tests whether the sub-dimensions of effectuation and causation can explain firm survival on 2014, the binary logistic regression is marginally significant ($\chi^2_{(8)} = 14.35$; p < .10). Within Model 1.2b *affordable loss* and *partners* display a statistically and marginally significant positive and negative incline parameters for the chance of survival on 2014 (B = 1.37; $SE_B = 0.58$; $Wald_{(1)} = 5.58$; p < .05; and B = -1.82; $SE_B = 3.09$; $Wald_{(1)} = 3.09$; p < .10). The hypothesis is partially supported as two of the four sub-dimensions of effectuation can explain firm survival on 2014, no sub-dimension of causation can.

**Table 9**

**Binary logistic regressions for firm survival explained by sub-dimensions of effectuation and causation**

| | | Model 1.1b: survival 2004 | | | Model 1.2b: survival 2014 | | |
|---|---|---|---|---|---|---|---|
| | | B ($SE_B$) | Wald | p | B ($SE_B$) | Wald | P |
| Effectuation | Affordable loss | 0.11(0.28) | 0.16 | 0.69 | **1.37(0.58)** | **5.58** | **0.02** |
| | Partners | -0.09(0.36) | 0.07 | 0.79 | **-1.82(1.03)** | **3.09** | **0.08** |
| | Means-oriented | 0.57(0.6) | 0.90 | 0.34 | -0.81(1.21) | 0.45 | 0.50 |
| | Non-Predictive | 0.2(0.82) | 0.06 | 0.81 | -1.13(1.33) | 0.73 | 0.39 |
| Causation | Expected return | -0.28(0.59) | 0.22 | 0.64 | 1.63(1.29) | 1.60 | 0.21 |
| | Competitors | -0.24(0.37) | 0.42 | 0.52 | -0.32(0.73) | 0.19 | 0.66 |
| | Ends-oriented | -0.1(0.37) | 0.07 | 0.79 | -0.46(0.72) | 0.41 | 0.52 |
| | Predictive | 0.24(0.51) | 0.22 | 0.64 | 0.35(0.89) | 0.15 | 0.70 |
| | | $\chi^2$ | df | $R^2$ P | $\chi^2$ | df | $R^2$ | p |
| | | 2.70 | 8 | 0.05 0.95 | **14.35** | **8** | **0.35** | **0.07** |

$^{*}$ p < .05, $^{**}$ p < .01, $^{+}$ p < .10

## 5.3 Post-hoc on Effectuation Sub-Dimension Partners

The variable *partners* explaining a negative trajectory seemed counterintuitive, which is why a post-hoc binary logistic regression analysis was devised to investigate whether *partners* is related to the chance for mergers and acquisition 2014. This variable measured whether the firms from the business plans had merged with- or been acquired by- another company by the year 2014. The binary logistic regression was statistically significant ($\chi^2_{(1)} = 4.34$; p < .05) and reveals a positive incline parameter for *partners* on the chance for mergers and acquisition

2014 (B = 0.54; $SE_B$ = 0.25; $Wald_{(1)}$ = 4.82; p < .05). Survival is coded as surviving individually and a merger or an acquisition is coded as not surviving. In other words, the negative incline parameter for *partners* can be explained by the negative coding of mergers and acquisitions. Further sub-dimensions of effectuation or causation did not display a statistically significant incline parameter.

### 5.4 Hypothesis 2

To determine whether firm survival can be explained by industry dynamism, several models were tested with binary logistic regression (Table 10). Model 2.1 tests whether industry dynamism of the years 1998 – 2004 can explain firm survival on 2004. The binary logistic regression is not significant ($\chi^2_{(1)}$ = 2.09; p = .15). Further analyses are omitted.

Model 2.2 tests whether industry dynamism of the years 2005 – 2013 can explain firm survival on 2014. The binary logistic regression is marginally significant ($\chi^2_{(1)}$ = 2.99; p < .10). Within Model 2.3 industry dynamism of the years 2005 – 2013 displays a marginally significant positive incline parameter for the chance of survival on 2014 (B = 0.34; $SE_B$ = 0.19; $Wald_{(1)}$ = 3.15; p < .10).

Model 2.3 tests whether industry dynamism of the years 1998 – 2013 can explain firm survival on 2014. The binary logistic regression is not significant ($\chi^2_{(1)}$ = 0.03; p = .86). Further analyses are omitted. The hypothesis is not supported as industry dynamism can explain firm survival on 2014, but does so with a positive instead a negative incline parameter.

**Table 10**

**Binary logistic regressions for firm survival explained by industry dynamism**

| | | Model 2.1: survival 2004 | | | | Model 2.2: survival 2014 | | | | Model 2.3: survival 2014 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B ($SE_B$) | | Wald | p | B ($SE_B$) | | Wald | p | B ($SE_B$) | | Wald | p |
| Industry Dynamism | 1998 – 2004 | -0.14(0.1) | | 2.08 | .15 | | | | | | | | |
| | 2005 – 2013 | | | | | **0.34(0.19)** | | **3.15** | **.08** | | | | |
| | 1998 – 2013 | | | | | | | | | 0.05(0.25) | | 0.03 | .86 |
| | | χ2 | df | R2 | p | χ2 | df | R2 | p | χ2 | df | R2 | p |
| | | 2.09 | 1 | 0.01 | .15 | **2.99** | **1** | **0.04** | **.08** | 0.03 | 1 | 0.00 | .86 |

$^{*}$ p < .05, $^{**}$ p < .01, $^{+}$ p < .10

### 5.5 Post-hoc on Industry Dynamism of the Years 2005 – 2013

The variable industry dynamism of the years 2005 – 2013 explaining a positive trajectory seemed counterintuitive, which is why a post-hoc binary logistic regression analysis was devised to investigate whether industry dynamism of the years 2005 – 2013 is related to the

chance for mergers and acquisition 2014. This variable measured whether the firms from the business plans had merged with- or been acquired by- another company by the year 2014. The binary logistic regression was marginally significant ($\chi^2_{(1)} = 2.67$; $p = .10$) and reveals a positive incline parameter for industry dynamism of the years 2005 – 2013 on the chance for mergers and acquisition 2014 ($B = 0.42$; $SE_B = 0.24$; $Wald_{(1)} = 3.09$; $p < .10$). Survival is coded as surviving individually and a merger or an acquisition is coded as not surviving. This analysis can be understood as more industry dynamism evokes more mergers and acquisitions. However, this does not serve as an explanation for why industry dynamism is positively associated with more firm survival.

### 5.6 Hypothesis 3

To determine whether more industry dynamism leads to more effectuation two OLS regression analyses were conducted. The aggregate scores for effectuation and causation were taken as dependent variables and industry dynamism of the years 1998 – 2004 as the independent variable. No statistically significant predictive value of industry dynamism (between 1998-2004) on effectuation was found (Model 3.1: $F (1; 223) = 2.02$; $p = .16$) and no statistically significant predictive value of industry dynamism of the years 1998 – 2004 on causation was found (Model 3.2: $F (1; 224) = 0.50$; $p = .48$). The hypothesis is not supported since no connection between industry dynamism and effectuation was found.

**Table 11**

**OLS regressions for effectuation explained by industry dynamism**

| | | Model 3.1: effectuation | | | | Model 3.2: causation | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | B ($SE_B$) | t | | p | B ($SE_B$) | t | | p |
| Industry Dynamism | 1998 – 2004 | -0.04(0.02) | -1.42 | | .16 | 0.01(0.02) | 0.71 | | 0.48 |
| | | F | df | $R^2$ | p | F | df | $R^2$ | p |
| | | 2.02 | 1/223 | .01 | .16 | 0.50 | 1/224 | .00 | .48 |

$^{*}$ $p < .05$, $^{**}$ $p < .01$, $^{+}$ $p < .10$

### 5.7 Hypothesis 4

Model 4.1a tests whether effectuation, causation and industry dynamism of the years 1998 – 2004 can explain firm survival on 2004. The binary logistic regression is marginally significant ($\chi^2_{(3)} = 6.28$; $p < .10$). Within model 4.1a effectuation displays a marginally significant positive incline parameter for the chance of survival on 2004 ($B = 0.56$; $SE_B = 0.30$; $Wald_{(1)} = 3.61$; $p < .10$). The hypothesis is not supported, since no contribution of industry dynamism to effectuation could be detected.

Model 4.2a tests whether effectuation, causation and industry dynamism of the years 2005 – 2013 can explain firm survival on 2014. The binary logistic regression is marginally significant ($\chi^2_{(3)} = 7.43$; $p < .10$). Within model 4.2a effectuation and industry dynamism of the years 2005 – 2013 display marginally significant positive incline parameters for the chance of survival on 2014 ($B = 0.68$; $SE_B = 0.35$; $Wald_{(1)} = 3.85$; $p < .10$; and $B = 0.33$; $SE_B = 0.19$; $Wald_{(1)} = 2.81$; $p < .10$). The hypothesis is supported, since a contribution of industry dynamism to effectuation could be detected.

Model 4.3 tests whether effectuation, causation and industry dynamism of the years 1998 – 2013 can explain firm survival on 2014. The binary logistic regression is not significant ($\chi^2_{(3)} = 4.77$; $p = .19$). Further analyses are omitted. The hypothesis is not supported, since the model is not significant.

**Table 12**

**Binary logistic regressions for firm survival explained by effectuation, causation and industry dynamism**

| | | Model 4.1a: survival 2004 | | | | Model 4.2a: survival 2014 | | | | Model 4.3a: survival 2014 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B ($SE_B$) | Wald | | P | B ($SE_B$) | Wald | | P | B ($SE_B$) | Wald | | P |
| Effectuation | | **0.56(0.30)** | **3.61** | | **.06** | **0.68(0.35)** | **3.85** | | **.05** | **0.72(0.35)** | **4.24** | | **.04** |
| Causation | | 0.07(0.35) | 0.04 | | .84 | 0.08(0.41) | 0.03 | | .86 | 0.01(0.41) | 0.00 | | .98 |
| Industry Dynamism | 1998 – 2004 | -0.12(0.10) | 1.49 | | .22 | | | | | | | | |
| | 2005 – 2013 | | | | | **0.33(0.19)** | **2.81** | | **.09** | | | | |
| | 1998 – 2013 | | | | | | | | | 0.03(0.25) | 0.01 | | .91 |
| | | $\chi^2$ | df | $R^2$ | P | $\chi^2$ | df | $R^2$ | P | $\chi^2$ | df | $R^2$ | P |
| | | **6.28** | **3** | **.04** | **.10** | **7.43** | **3** | **.05** | **.06** | 4.77 | 3 | .03 | .19 |

$^{*}$ $p < .05$, $^{**}$ $p < .01$, $^{+}$ $p < .10$

Model 4.1b tests whether the sub-dimensions of effectuation and causation and industry dynamism of the years 1998 – 2004 can explain firm survival on 2004. The binary logistic regression is not significant ($\chi^2_{(9)} = 2.70$; $p = .97$). Further analyses are omitted due to statistical insignificance of the model. The hypothesis is not supported, since the model is not significant.

Model 4.2b tests whether the sub-dimensions of effectuation, causation and industry dynamism of the years 2005 – 2013 can explain firm survival on 2014. The binary logistic regression is not significant ($\chi^2(9) = 14.36$; $p = .11$). Further analyses are omitted due to statistical insignificance of the model. The hypothesis is not supported, since the model is not significant. The hypothesis is not supported, since the model is not significant.

Model 4.3b tests whether the sub-dimensions of effectuation and causation and industry dynamism of the years 1998 – 2013 can explain firm survival on 2014. The binary logistic regression is statistically significant ($\chi^2_{(9)} = 18.67$; $p < .05$). Within model 4.3b, affordable loss

and industry dynamism of the years 1998 – 2013 display statistically and marginally significant positive and negative incline parameters for the chance of survival on 2014 (B = 1.39; $SE_B$ = 0.60; $Wald_{(1)}$ = 5.37; $p < .05$; and B = -2.97; $SE_B$ = 1.64; $Wald_{(1)}$ = 3.30; $p < .10$). Further sub-dimensions of effectuation or causation did not display a statistically significant incline parameter. The hypothesis is partially supported, since affordable and industry dynamism of the years 1998 – 2013 can explain firm survival on 2014.

**Table 13**

**Binary logistic regressions for firm survival explained by sub-dimensions of effectuation and causation and industry dynamism**

| | | Model 4.1b: survival 2004 | | | | Model 4.2b: survival 2014 | | | | Model 4.3b: survival 2014 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B ($SE_B$) | Wald | | P | B ($SE_B$) | Wald | | P | B ($SE_B$) | Wald | | P |
| Effectuation | Affordable loss | 0.11(0.28) | 0.16 | | .69 | **1.37(0.58)** | **5.54** | | **.02** | **1.39(0.60)** | **5.37** | | **.02** |
| | Partners | -0.1(0.37) | 0.07 | | .80 | **-1.82(1.03)** | **3.09** | | **.08** | -1.30(1.03) | 1.60 | | .21 |
| | Means-oriented | 0.56(0.61) | 0.87 | | .35 | -0.79(1.24) | 0.41 | | .52 | -0.63(1.46) | 0.18 | | .67 |
| | Non-Predictive | 0.20(0.82) | 0.06 | | .81 | -1.18(1.44) | 0.67 | | .41 | -1.53(1.74) | 0.77 | | .38 |
| Causation | Expected return | -0.28(0.59) | 0.22 | | .64 | 1.63(1.29) | 1.59 | | .21 | 1.51(1.3) | 1.36 | | .24 |
| | Competitors | -0.23(0.37) | 0.39 | | .53 | -0.32(0.73) | 0.20 | | .66 | -0.67(0.82) | 0.65 | | .42 |
| | Ends-oriented | -0.1(0.38) | 0.07 | | .79 | -0.49(0.77) | 0.40 | | .53 | -0.3(0.84) | 0.13 | | .72 |
| | Predictive | 0.24(0.51) | 0.22 | | .64 | 0.35(0.89) | 0.15 | | .70 | 0.21(0.97) | 0.05 | | .83 |
| Industry Dynamism | 1998 – 2004 | 0.00(0.21) | 0.00 | | .98 | | | | | | | | |
| | 2005 – 2013 | | | | | 0.07(0.77) | 0.01 | | .93 | | | | |
| | 1998 – 2013 | | | | | | | | | **-2.97(1.64)** | **3.30** | | **.07** |
| | | $\chi^2$ | df | $R^2$ | P | $\chi^2$ | df | $R^2$ | P | $\chi^2$ | df | $R^2$ | P |
| | | 2.70 | 9 | .05 | .97 | 14.36 | 9 | .35 | .11 | **18.67** | **9** | **.45** | **.03** |

$^{*}$ $p < .05$, $^{**}$ $p < .01$, $^{+}$ $p < .10$

## 5.8 Summary of Hypotheses

In summary, effectuation and industry dynamism can partly explain firm survival at 2004 and 2014. The explanatory values of effectuation and industry dynamism are not stable over all models, suggesting that other events and elements of the business world (e.g. external environment or internal changes) play a role in keeping the businesses from failing. Causation seems to not contribute to the explanatory value of any model containing effectuation and industry dynamism.

**Table 14**

**Summary of tested hypotheses, decisions and formulated conclusions**

| | Hypothesis | Decision | Conclusion |
|---|---|---|---|
| 1 | firm survival can be explained by effectuation and causation | supported | More effectuation can be associated with higher firm survival. The sub-dimensions are only partially supported |
| 2 | firm survival can be explained by industry dynamism | rejected | No negative association between industry dynamism and firm survival |
| 3 | more industry dynamism leads to more effectuation | rejected | No positive association between the magnitude of industry dynamism and effectuation |

| | | | |
|---|---|---|---|
| 4 | effectuation, causation and industry dynamism can explain firm survival | partially | Effectuation and industry dynamism are positively associated with firm survival. The sub-dimensions are partially supported as well. |

## 6. DISCUSSION

This paper constitutes an attempt to quantitatively assess the explanatory value of causation, effectuation and industry dynamism for firm survival. It is postulated that effectuation leads to more firm survival than causation since effectuation balances the resource constraints new ventures are typically faced with (Gabrielsson et al., 2013; Read, Dew, et al., 2009) and provides a flexible framework for adaptive action and decision-making to optimally exploit contingencies (Sarasvathy, 2001). The obtained data support this assumption on the main dimension of effectuation. Further, it is postulated that the positive impact of effectuation is due to building a strong network of partners and by trying to co-create the future rather than wasting resources on prediction logic (Gabrielsson et al., 2013; Read, Dew, et al., 2009). The data support the assumption that two of the sub-dimensions of effectuation, namely *affordable loss* and *partners*, play a role in realizing firm survival. The sub-dimension *affordable loss* is based on the entrepreneur's assessment of what they are willing to lose. The goal is to limit downside potential by never investing more resources into opportunities than the stakeholders can afford to lose (Read et al., 2009). This is, especially under consideration of the resource constraints new ventures usually have to deal with, a reasonable coping mechanism to not go bankrupt in the first few years after founding. At the same time, the resource constraints also imply that entrepreneurs have to consider opportunities more carefully and analyse the respective risks that may be involved because pursuing the wrong opportunities could lead to non-survival fast.

The initial negative association of the second sub-dimension of effectuation, namely *partners*, was revealed to be due to the higher amount of companies being lost due to mergers and acquisitions than to simple non-survival. A high openness to partners at the time of writing the business plan more frequently resulted in an eventual merger with, or acquisition by, another company than a low openness to partners at the time of writing the business plan. Since mergers and acquisitions by other firms can be considered a success for the firm, investing resources in building partnerships appears to be a good strategy for new ventures.

It is postulated that uncertainty is a crucial factor determining firm survival (Anderson, 2001). In contrast to this postulation, this paper could not establish a negative link between industry dynamism and firm survival. Even more unexpectedly, a positive link was found suggesting that more industry dynamism facilitates firm survival.

One possible explanation for this unexpected result might lie in the overestimation of the importance of objective uncertainty (industry dynamism) and the underestimation of the importance of subjective (perceived) uncertainty. As a result, perceived uncertainty might weigh more strongly than objectively measured uncertainty in the decisions a firm makes and the effects these decisions have on firm survival. Another explanation could be the fact that no measure of an entrepreneur's reaction to uncertainty was taken and corrected for. The high survival despite the high industry dynamism might be explained by an effective entrepreneurial coping strategy such as effectuation.

Since new ventures are naturally exposed to certain levels of uncertainty (Mc Kelvie et al., 2011) and since effectuation is considered to be an effective means for coping with uncertainty (Sarasvathy, 2001), it is posited that more industry dynamism induces more effectuation. However, this paper could not establish a link between industry dynamism and either effectuation or causation. Businesses that are faced with higher uncertainty do not employ more effectuation even though this is considered to be a good solution for coping with uncertainty. One possible reason for this is that entrepreneurs do not know about the different entrepreneurial strategies and about when to best apply which. Another possible reason for this is that they apply a combination of knowledge acquired in business schools, which mainly teaches the causal decision-making approach (Sarasvathy, 2001), and an intuitively effectual approach that best suits their respective needs.

Yet another angle that could explain these results might lie in the fact that the time span for which industry dynamism was calculated (in this case the years 1998 - 2004) is not a sufficient representation of the industry dynamism that was present at the time of writing the business plans. The majority of business plans (92 percent) have been written between 1999 and 2001 and an industry dynamism leading up to 2000 (e.g. an industry dynamism time span ranging from 1995-2000) might have more accurately covered the actual industry dynamism present at the time of writing the business plan. However, it is also possible that entrepreneurs use a subjective measure of uncertainty rather than an objective measure as

employed in this paper and that this is the reason for the erratic results. This would be another reason to focus future research on measuring perceived uncertainty.

It is postulated that effectuation leads to more firm survival under condition of uncertainty than causation (Sarasvathy, 2001). The findings of the present paper suggest that uncertainty plays a role, but the findings are not definite. Sometimes a clear association of uncertainty with firm survival was found, while at other times uncertainty did change the outcomes without a distinct direction. A possible explanation for the inconsistent results might lie in the fact that industry dynamism was calculated for a time span post-formulation of the business plans. Certain events such as 9/11 and the NASDAQ crash most probably affected the uncertainty measures, but could not have affected the writing of the business plans as this action took place before the incidents.

Yet again, another possible explanation for the inconsistency might lie in the overestimation of the importance of objective uncertainty (industry dynamism) and the underestimation of the importance of subjective (perceived) uncertainty. The present study tried to quantify uncertainty with the objective measure industry dynamism. This objective measure is a rather complex calculation of different hard-to-get business parameters that may not be accessible or comprehensible for most entrepreneurs. So, rather than an objective measure of the environmental uncertainty, a subjective measure thereof might have captured more closely how the businesses view their opportunities and risks and how they perceive the environmental uncertainty facing their business. This is supported by Samsami (2015) who states that the relationship between perceived uncertainty and decision-making style is more important than other parameters. It may therefore not be enough to research only industry dynamism's (objective uncertainty's) moderating influence on the degree of causation and effectuation displayed in a firm's business plans, but necessary to look at a combination of both industry dynamism and perceived uncertainty to get a better understanding of the influence of environmental uncertainty on the choice of entrepreneurial logic. A third possible explanation for the incongruence could be that firm survival is not an adequate indicator of firm performance.

This paper produced interesting, yet complex results. The results seem to support the notion that effectuation is the superior entrepreneurial approach for realizing firm survival. Industry dynamism as a moderating variable does have an effect, but this effect cannot be established with clarity. Clearer results may have been obstructed by correcting for the

historic events within the observed time span which would have necessitated the incorporation of certain control variables and by using a subjective measure for environmental uncertainty.

### 6.1 Limitations

There are a number of limitations to this study. One problem arises from the fact that business plans are usually written to raise money for the business. The general perception to business plan writing seems to be that the more thoroughly information is collected and presented, the better the business and the higher the chances to receive funding. As a consequence, business plan writers might be inclined to write very extensive business plans that do not reflect the actual entrepreneurial logic employed by the entrepreneurs and top management accurately.

Another issue affecting the dataset could be the coding scheme in itself, which is not detailed enough to represent the actual differences between causation and effectuation. Part of the problem is the difficulty to develop empirical measures that accurately capture the underlying realities. Both these issues have potentially affected results. A possible solution to these problems might be to combine empirical databases with qualitative measures (e.g. interviews with the respective entrepreneurs) in the future to get a more complete picture of the entrepreneurial approach employed.

An important limitation of the industry dynamism construct is the fact that not enough data was available to calculate industry dynamism scores for time spans before 1998. Since most business plans were written around the year 2000, there is hence no measure for industry dynamism at the time of writing the business plan available. This renders a possibly insightful regression between effectuation and causation found in business plans and the respective industry dynamism before writing invalid.

### 6.2 Suggestions for Future Research

One interesting research direction that directly results from this paper is to study the effect of subjective uncertainty on the choice of entrepreneurial approach and firm survival, either individually or in combination with objective uncertainty. Ghosh et al. (2014) suggests that perception mediates between the objective environment and makes meaning of it to take required action. Samsami (2015) even states that environmental perceptions are more important than environment characteristics for managerial decisions. Future research could

profit from combining objective and subjective uncertainty and use them both to analyse their effect on the success of causation and effectuation strategies.

Another possibility to bring a new angle to the relationship between the entrepreneurial approach employed, industry dynamism and firm survival is to include the venture's initial conditions. According to Gao et al. (2010), new venture performance is strongly affected by a venture's initial conditions. These conditions are the entrepreneurial quality (e.g. team heterogeneity and know-how), characteristics of the venture (e.g. degree of product novelty and initial founding conditions), the external environment (industry structure and competitive environment), the entrepreneurial process (venture strategy and legitimacy generation) and the available resources (initial financial resources and general human capital). While some of the conditions have been partly discussed in this paper, focusing on others might yield some new insights. The resource aspect in particular could add some insight into this discussion as it has already been established that the initial resources available at start-up do affect a firm's ability to survive the first few years (Aspelund et al., 2005), but has not yet been studied in relation to the entrepreneurial approach.

Besides further researching other independent variables, looking at some alternative dependent variables besides firm survival may yield some additional knowledge. The reasoning for this is twofold. For one, it has been argued that firm survival is the superior measure of firm performance in the start-up stage of business since generally applied profitability measures are not representative of success in the early stages of business due to the fact that profit generation is not a key goal yet (Baum et al., 2001; Mudambi et al., 2007). However, other performance measures may become relevant when the firm matures and when the focus is no longer mainly on reaching customers and building product awareness (Mudambi et al., 2007). Additionally, firm survival is a binary, and therefore rather simplistic, measure (yes or no) and other more diverse measures might prove to be more insightful in the later stages of business. Alternative dependent variables may be financial measures such as profit, sales or market share performance.

## 7. CONCLUSION

This study was designed to investigate the relationship between the level of causation and effectuation as displayed in a firm's business plan and firm survival while also taking

industry dynamism into account. The findings suggest that effectuation and partially industry uncertainty can explain firm survival on 2004 and 2014. Causation seems to not contribute to the explanatory value of models containing effectuation. New insights into the relationship between causation, effectuation and firm survival could be obtained from combining the existing empirical data with additional qualitative data that counteract the limitations listed above.

This paper should not be used to suggest that effectuation should always be the modus operandi. The insights gained from the reported data are promising, although a lot of questions and concerns could not be answered. Effectuation and industry dynamism seem to be predictors of firm survival and speculatively also to other measures of firm performance.

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## Appendix A: Coding Scheme Causation & Effectuation

| | Construct | Variable Description | Measurement Variable | Unit |
|---|---|---|---|---|
| | Name of the Company | | | |
| | Names of the Entrepreneurs | | | |
| | Founding Date | | | |
| | Date of Business Plan | | | |
| | Team Size | Size of the entrepreneur/management team | Total number of entrepreneurs/management team members at the time of seeking investors | # |
| Predictive Control | Business Plan Pages | Number of pages of business plans | Rounding to whole pages | # |
| | Market Analysis Pages | Pages dedicated to market analysis, excluding marketing strategy | Rounding to 1/2 pages. No pages spent on describing market analysis=0 | # |
| | Assumptions | To which extent have assumptions been used to develop the business plans and financial projections? | 1) Very Low (No assumptions were reported in the plan) 2) Low (Assumptions are general and do not impact plans) 3) Average (Assumptions are general and have a minor impact in the plans) 4) High (Assumptions are well identified and have a significant impact in the plans) 5) Very high (Assumptions are very well identified and have a large impact in the plans) | 1-5 |
| | Market Analysis Complexity | Complexity of the market analysis | 1) no market analysis at all 2) short and superficial market analysis based on own projections 3) general market analysis based on own projections and little external data 4) extensive market analysis including external data 5) very extensive and precise market analysis mostly based on external data | 1-5 |
| | Marketing Tables & Figures | Amount of tables and figures used in the marketing section of the business plan | Total amount of figures and tables | # |
| | Number of Instances of Obligations, Necessities & Duties | Use of modal verbs (deontic modality) | Word count of conjugations of verbs 'have to', 'must', 'should' | # |
| Non-Predictive Control | New markets | (a) new market(s) have/has been identified in the business plan | Does the plan mention the identification of a new/unidentified market? (no/yes) | 0-1 |
| | Age at the Time of Writing | Number of years between founding the company and writing the business plan | Rounding to ½ years. Cannot be determined? Missing variable | # |
| | New Products | Amount of new products, services or combination of products and services identified in business plans | No new products, services or combinations of products and services are introduced = 0 | # |
| | Past Actions | Business plan mentions past actions related to business development such as customer feedback or product development | At the time the plan was written, how many of the following business activities had already been taken: - business analysis (e.g. business idea, business model, business plan) - resource assembly (e.g. attracting finance, hiring employees, buying equipment) - product development (e.g. product design, prototype, patent filed) - legal start (e.g. business registered) - marketing (e.g. marketing efforts started, promotion done, advertising) 1. none or 1 (none is hypothetical, since of all them did this for writing the plan) 2. 2 3. 3 4. 4 5. all (business is already running) Writing a business plan counts so 1 is the default value. | # |
| Ends-Oriented | Growth Orientation | Business plans mention a clear growth intention (sales growth, production growth, revenue growth, going public, self-funding, product growth, profit growth, job growth) | The business plan reflects... 1) ...no growth intention (e.g., single person company, minor revenues) 2) ...a minor growth intention (e.g., 2-10 employees, <2 million revenues) 3) ...a moderate growth intention (e.g., 11-50 employees, <10 million revenues) 4) ...a strong growth intention (e.g, 51-250 employees, <50 million revenues) 5) ...a very strong growth | 1-5 |

| | | | | |
|---|---|---|---|---|
| | | | intention (e.g., 250+ employees, 50+ million in revenue | |
| | Market Share | Mentioning of an intended market share in the business plans | Mentioning of an intended market share (no/yes) | 0-1 |
| Means-Oriented | Members Advisory Board | Amount of members participating in advisory board, board of directors (only if role is not active and therefore advisory), or industry experts. | No advisory members mentioned = 0 | # |
| | Start-Up Experience | The amount of companies previously started by the founding team. No founders mentioned, info management team is used. | Total amount of companies previously started by the founders. | # |
| | Entrepreneurial Team Business Competencies | The business competencies of the management team according to their educational background | Number of management team members holding a higher education degree in Business Administration related studies (General Management, Accounting, Economics, MBAs, Entrepreneurship studies, Business School studies) | # |
| | Entrepreneurial Team Technical Competencies | The technical competencies of the management team according to their educational background | Number of management team members holding a higher education degree in Technical studies (Science, Technology, engineering & Mathematics) | # |
| | Number of Instances of Theoretical Possibilities | Use of modal verbs to denote possibility, likelihood or uncertainty (epistemic modality) | Word count 'can', 'could', 'may', 'might' | # |
| | Fit with Previous Experience | Degree to which the business plan fits / is a continuation of the previous experience of the founding team. No founders mentioned, info management team is used. | 1) not at all related to previous experience of the founding team 2) similar competences required than in previous activities of the founding team (previous job, other ventures) 3) in the same industry as previous activities of the founding team (previous job, other ventures) 4) similar kind of product/service as previous activities of the founding team (previous job, other ventures) 5) direct continuation of previous activities of the founding team (previous job, other ventures) | 1-5 |
| Expected Return | Market Segmentation | The amount of market segments targeted in business plans | No segments targeted = 0 | # |
| | Projected Years | Amount of years projected | No years of revenue projection = 0 | # |
| | Selected Strategy | The business plans describe a clear strategy (promotion, pricing, distribution, sales) for achieving established goals | 1) No strategy described 2) Short and general description of strategy 3) General description of strategy 4) Extensive strategy description 5) Very extensive strategy description | 1-5 |
| | Precision of Financial Projections | Amount of detail of the financial projects | 1) no financial projections at all 2) short-term and general financial projections (may include balance sheet, income statement, …) 3) long-term general financial projections (may include balance sheet, income statements, …) 4) extensive financial projections (may include balance sheet, income statements, operational costs, planned investments, …) 5) very extensive and detailed financial projections (may include monthly calculations, …) | 1-5 |
| Affordable Loss | Required Start-Up Capital | Amount of capital asked in business plans. | Amount of capital in $ | # |
| | Risks | The business plans mention the risks with regard to the feasibility of the plan | 1) No risks mentioned 2) Short and general description of risks 3) General risk analysis 4) Extensive risk analysis 5) Very extensive risk analysis | 1-5 |
| Competitive Analysis | Pages on Competitive Analysis | Amount of pages spent on describing competitors | Rounding to ½ pages. No pages on describing competitors = 0 | # |

| | | | | |
|---|---|---|---|---|
| | Amount of Competitors | Amount of competitors mentioned in business plans | No competitors mentioned/described = 0 | # |
| Seeking Partnerships | Amount of Partnerships | Amount of partnerships mentioned/described in business plans | No partnerships described = 0 | # |
| | Pages on Partnerships | Amount of pages spent on describing partners(hips) | Rounding to 1/2 pages. No pages spent on describing partner(ships)=0 | # |
| | Openness to Potential Partnerships | To which level mentions the plan their openness towards potential partnerships? (actual and potential) | 1) No partnerships are mentioned. 2) Partnerships are described in general 3) Partnerships are described in general and some partners identified 4) Partnerships are described in detail with some partners identified 5) Partnerships with specific partners are described in detail | 1-5 |
| Control Variables | Team Experience | Team's exposure to different industries | 1) no industry experience 2) limited industry experience; 1-5 years mostly within a single industry 3) moderate industry experience; 5-10 years within some industries 4) experienced; 10-15 years of experience within multiple industries 5) very experienced; decades of experience across many industries and positions | 1-5 |
| Dependent Variables | Survival 2004 | Did the company survive past 2004 | Survival of the company past 2004 (no/yes) | 0-1 |
| | Survival 2014 | Did the company survive past 2014 | Survival of the company past 2004 (no/yes) | 0-1 |

## Appendix B: Inter-Rater Reliability of Coding Scheme Business Plans

| Code | Cohen's K | df | t | Strength of Agreement |
|---|---|---|---|---|
| Team Size | 1.00** | 31 | 14.84 | excellent |
| Business Plan Pages | 0.97** | 34 | 28.94 | excellent |
| Market Analysis Pages | 0.25** | 33 | 6.5 | poor |
| Assumptions | 0.53** | 33 | 6.04 | intermediate to good |
| Market Analysis Complexity | 0.60** | 33 | 6.32 | intermediate to good |
| Marketing Tables & Figures | 0.84** | 33 | 9.54 | excellent |
| Nr. of Instances of Obligations | 0.41** | 33 | 4.57 | intermediate to good |
| New Markets | 0.43* | 33 | 2.53 | intermediate to good |
| New Products | 0.65** | 33 | 6.01 | intermediate to good |
| Past Actions | 0.51** | 32 | 5.36 | intermediate to good |
| Growth Orientation | 0.95** | 31 | 7.52 | excellent |
| Market Share | 0.80** | 32 | 4.61 | excellent |
| Members Advisory Board | 0.81** | 31 | 7.57 | excellent |
| Start-up Experience | 0.69** | 30 | 7.21 | intermediate to good |
| Entrepreneurial Team Business Competencies | 0.87** | 29 | 8.8 | excellent |
| Entrepreneurial Team Techn. Competencies | 0.79** | 30 | 6.47 | excellent |
| Nr. of Instances of Theoretical Possibilities | 0.10 | 32 | 1.77 | poor |
| Fit with Previous Experience | 0.38** | 29 | 3.77 | poor |
| Market Segmentation | 0.76** | 31 | 7.29 | excellent |
| Projected Years | 1.00** | 31 | 10.2 | excellent |
| Selected Strategy | 0.58** | 32 | 5.5 | intermediate to good |
| Precision of Financial Projections | 0.80** | 31 | 8.29 | excellent |
| Required Start-up Capital | 0.92** | 27 | 17.13 | excellent |
| Risks | 0.72** | 32 | 6.91 | intermediate to good |
| Pages on Competitive Analysis | 0.46** | 32 | 8.93 | intermediate to good |
| Amount of Competitors | 0.93** | 32 | 16.16 | excellent |
| Amount of Partnerships | 0.87** | 30 | 10.09 | excellent |
| Pages on Partnerships | 0.16** | 32 | 4.45 | poor |
| Openness to Potential Partnerships | 0.51** | 33 | 5.48 | intermediate to good |
| Team Experience | 0.55** | 29 | 4.42 | intermediate to good |

* $p < .05$, ** $p < .01$

## Appendix C: Collection of Data for Uncertainty Measurements

| Variables | Database | Link | Additional Information |
|---|---|---|---|
| Industry Employees | Bureau of Labor Statistics | http://data.bls.gov /pdq/SurveyOutputServlet | The number of employees as of January for each year/sector |
| Industry Establishments | United States Census Bureau | http://www.census.gov /econ/susb/data/susb1998.html | U.S. NAICS sector, large employment sizes --> number of establishments |
| Value Added by Industry (GDP) | U.S. Department of Commerce - Buerau of Economic Analysis | http://www.bea.gov /industry/gdpbyind_data.htm | Data was withdrawn from the excel file "GDP by industry", tab "VA" |
| R&D Intensity | Industrial Research and Development Information System | http://www.nsf.gov /statistics/iris/search_results.cfm | Industrial R&D as a percentage of net sales |