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CAUSATION AND EFFECTUATION: MEASUREMENT DEVELOPMENT AND VALIDATION

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ABSTRACT

In this article we attempt to develop and validate measures of both causation and effectuations processes. Using a pilot study consisting of 180 firms and a second study of 196 firms we find that causation processes appear to be a well-defined and coherent set of practices that can be viewed as a unidimensional construct. However, concerning effectuation processes our findings were not as clear. In the pilot study we established that effectuation consisted of several subdimensions. We theoretically developed these subdimensions (flexibility, experimentation, affordable loss, precommitments, and partnering) further and tested them in the second study. Goodness of fit tests indicate that the first order model and second order model fit the data similarly. Therefore, we were unable to establish that the five independent factors are a subdimension of the larger construct called effectuation.

INTRODUCTION

In her groundbreaking article, Sarasvathy (2001) discusses causation and effectuation as different approaches to the venture creation process. Causation processes are consistent with designed strategy models (Mintzberg, 1978). The foundation of these models is based on the rational reasoning found in neo-classical micro-economics. Caplan (1999) states that opportunity detection results from a rational search process in which alternatives are identified and analyzed. The alternative with the highest expected return is selected and implemented. Such models of entrepreneurship include the formulated and articulated intentions of the entrepreneur, backed up by the personal control of the entrepreneur, which ensures their surprise-free implementation. The planning and analysis required by such models assume conditions in which the distribution of outcomes in a group of instances is somewhat predictable through calculation or statistical inference (Sarasvathy, 2001). Entrepreneurial rents under such models accrue to individuals with superior search and implementation skills (Caplan, 1999).

In contrast, Sarasvathy (2001) proposes an *effectuation* model of entrepreneurship. She states that, under conditions of uncertainty, situations are unique to the extent that it is impossible to form a group from which to draw statistical inferences. Thus, under such conditions there is no reasonably feasible way to calculate an expected return for a given course of action. In this scenario, entrepreneurs are more likely to follow a decision process that differs from the logic inherent in causation models. Instead of analyzing alternatives and selecting the one with the highest expected return, the entrepreneur selects alternatives based on the affordability of experimentation, and hedges experiments by making alliances with and getting pre-commitments from potential suppliers, competitors, and customers. Hence, the decision criteria become the affordability of experimentation and the degree to which an uncertain outcome can be controlled through alliances and pre-commitments. Effectuation processes are more consistent with emergent strategy processes (Mintzberg, 1978).

Sarasvathy (2001) compares and contrasts causation and effectuation models by applying an analogy of a chef assigned to the task of cooking dinner. Following a causation model, the chef selects a menu in advance. The chef then lists the ingredients required, shops for them, and cooks the meal. In contrast, following an effectuation model the chef looks through the cupboards in the kitchen for possible ingredients and utensils. Then the chef imagines menus based on the available ingredients, selects a

menu, and begins to prepare the meal. In our own extension to her analogy, if friends show up with some additional ingredients, those ingredients might well be incorporated into the meal in progress.

Sarasvathy (2001) clearly articulates the causation and effectuation perspectives. However, because effectuation processes have not been clearly articulated before, measures that can be applied to interview or survey methodologies have not yet been developed. Our objective in this paper is to develop and provide evidence of construct validity for Likert-type scale measures of causation and effectuation processes. Our sample is composed of founders of 183 recently started firms in the medical instruments and electronic measuring devices industries. We use confirmatory factor analysis and reliability analysis to provide evidence of the construct, convergent and discriminant validity of the constructs.

MODEL VALIDATION

Validation Process

The objective of this paper is to provide evidence of construct validity for measures of causation and effectuation. Construct validity is defined broadly as the extent to which an operationalization measures the concept it is supposed to measure (e.g., Cook and Campbell, 1979). Construct validity has been highlighted as a central issue in organizational research (e.g., Webb and Weick, 1979; Schwab, 1980; Mitchell, 1985). According to Trochim (2001), construct validity consists of translation validity and criterion related validity. Translation validity is assessed subjectively and has two parts: face validity and content validity. Face validity is assessed subjectively by analyzing the operationalization of a construct and seeing whether on its face it seems to be a good translation of the construct. Content validity requires that the operationalization be checked against the relevant content domain for the construct. In order to provide evidence of translation validity we clearly describe causation and effectuation constructs and display our measures.

Whereas translation validity is assessed subjectively, criterion related validity is tested statistically, and tests whether the operationalization is related to measures of relevant criteria in the way predicted by theory (Trochim, 2001). We focus on three specific criteria: convergent criteria, discriminant criteria, and predictive or concurrent criteria.

Translation validity

As described in the introduction, two separate processes by which organizations develop have been identified: causation and effectuation.

Causation processes. Causation processes are based on the logic predominant in neoclassical economics and the strategic management literatures. This logic has extended to most of the textbooks on entrepreneurship, which tend to build the text around business planning models (eg. Allen, 2003, Kuratko & Hodgetts, 2004; Scarborough & Zimmerer, 2003; Timmons & Spinelli, 2004). According to Sarasvathy (2001: p. 245) "causation processes take a particular effect as a given and focus on selecting between means to create that effect." The causation process as described by Sarasvathy (2001) and as taught in the above entrepreneurship textbooks is a several stage process. It begins with environmental assessment and the analysis of long-run opportunities in the market. This is followed by the identification and analysis of target markets. Subsequently, a business plan is developed, resources are gathered, and the new venture is organized, implemented and controlled. The decision criterion for selecting an opportunity is based on the expected return of the decision. Sarasvathy (2001) states that causation processes focus on the predictable aspects of an uncertain future, attempt to control the future by predicting it, and are most likely to be applied in an attempt to gain market share in existing markets.

In our survey we included the following items to attempt to capture the causation construct:

1. We analyzed the long-run opportunities and selected what we thought would provide the best returns.
2. We researched and selected target markets and did meaningful competitive analysis.
3. We designed and planned business strategies.
4. We organized and implemented control processes to make sure we met objectives.

A subjective analysis of the items above provides evidence supporting the face validity and construct validity of their use in measuring the causation construct. This evidence is provided in two ways. First, when considered wholistically, the items are consistent with the causation construct as described by Sarasvathy (2001), thus providing face validity. Second, the range of items included in the measure appears to capture the entire domain of the construct, providing additional evidence for the scale's content validity.

Effectuation processes. In contrast with causation processes, effectuation processes "take a set of means as given and focus on selecting between possible effects that can be created with that set of means" (Sarasvathy, 2001: pg. 245). Chandler, DeTienne, and Hayton (2005) provided preliminary evidence that items measuring effectuation processes did not load cleanly onto a single factor. As a result, we carefully studied Sarasvathy's (2001) article and identified five specific subcomponents of effectuation. *Experimentation* is the process of trying different approaches in the marketplace before settling on a business concept. In the experimentation process there is not enough historical information on which to base good decisions. Thus, the business emergence process can be viewed as a series of affordable experiments to identify a business model that works. Second, *affordable loss* becomes an important criterion on which to base business decisions. Experiments that would cost more than the entrepreneurs can afford to lose are rejected in favor of affordable experiments. Third, Sarasvathy (2001) states that effectuation processes are characterized by *flexibility*. Entrepreneurs following effectuation processes must be flexible enough to take advantage of contingent opportunities, in contrast to causation processes that focus on developing and implementing a business plan. Fourth, the resources controlled by entrepreneurs are the starting point for effectuation processes. According to Sarasvathy (2001) individuals following effectuation processes evaluate the resources they have at hand and select options based on the resources they already control. Fifth, effectuation processes rely on the logic of control rather than the logic of prediction. Thus getting pre-commitments and *partnering* with customers, suppliers, and other strategic partners helps reduce the uncertainty associated with the venture.

Items used to measure each of the constructs are listed below:

Experimentation:
1. The product/service that we now provide is essentially the same as originally conceptualized (Reverse Scored).
2. We experimented with different products and/or business models.
3. The product/service that we now provide is substantially different than we first imagined.
4. We tried a number of different approaches until we found a business model that worked.

Affordable loss:
1. We were careful not to commit more resources than we could afford to lose.
2. We were careful not to risk more money than we were willing to lose with our initial idea.
3. We were careful not to risk so much money that the company would be in real trouble financially if things didn't work out.

Flexibility:
1. We allowed the business to evolve as opportunities emerged.
2. We adapted what we were doing to the resources we had.

3. We were flexible and took advantage of opportunities as they arose.
4. We avoided courses of action that restricted our flexibility and adaptability.

Precommitments:
1. We used a substantial number of agreements with customers, suppliers and other organizations and people to reduce the amount of uncertainty.
2. We used pre-commitments from customers and suppliers as often as possible.
3. We used agreements with other people and organizations to help deal with changes in our business environment.

Partnering:
1. Friends, family, and other network contacts provided services that we otherwise would have had to pay for.
2. We were able to use family, friends, and other network contacts to provide low cost resources.

Focus on resources:
1. We have focused on taking advantage of our resources and capabilities.
2. Our first consideration when selecting among business options was our knowledge and resources.
3. Our decision making has been based on the knowledge and resources we control.
4. When we started the business we carefully looked at our knowledge and resources before thinking about different alternatives for products/services.
5. When selecting opportunities our decision-making is focused more strongly on what we know how to do well than on external factors.

A subjective analysis of the items above suggests that the taken together, on their face the items look like they are measuring the effectuation construct and its subdimensions as described by Sarasvathy (2001). In addition, the range of items included in the measure appears to capture the entire domain of the construct. This subjective analysis provides evidence supporting both the face validity and the content validity of the construct.

Criterion related validity

Convergent and Discriminant Validity. According to Trochim (2001) criterion related validity includes convergent validity, discriminant validity, and concurrent or predictive validity. In contrast to translation validity, criterion related validity is assessed empirically and statistically. Bagozzi, Yi, and Phillips (1991) point out that Confirmatory Factor Analysis (CFA) is a powerful method for assessing construct validity. Evidence for convergent validity is provided when items intended to measure a construct load together. Evidence for discriminant validity is provided when items intended to measure different constructs do not load heavily on the target construct. Evidence for concurrent or predictive validity is provided when target constructs are related to or predict specific outcomes in the way specified by theory.

Concurrent Validity: Sarasvathy (2001) clearly articulates that neither causation processes nor effectuation processes are inherently better. Yet she also states that under conditions of risk, causation processes may be more appropriate, and under conditions of uncertainty, effectuation processes may be most appropriate. Conditions of risk occur when there is sufficient data to be able to make a reasonable approximation of the probability of different outcomes. For example, when flipping a coin one does not know whether the next flip will be heads or tails, but does know that the probability for obtaining "heads" is .5. In a business example, there have been so many McDonald's franchises opened, that given the population density and traffic patterns, one does not know the exact performance that will be attained, but by examining the performance distribution of other similar stores a reasonable prediction can be made for the future performance of a given store. In contrast, if someone is developing an essentially new product

or service that has not been provided before, estimates of success become far less certain. Thus, the McDonald's example is more consistent with conditions of risk, and the new product example is more consistent with conditions of uncertainty (i.e. Knight, 1946).

For the purposes of providing evidence of concurrent validity, causation measures should be negatively correlated with measures of uncertainty, whereas effectuation measures should be positively correlated with measures of uncertainty. Several researchers have proposed measures for perceived environmental uncertainty (Raven, McCullough, and Tansuhaj, 1994; Acherol and Stern 1988). This relationship with uncertainty will be used as one indicator of criterion-related validity.

METHODS: PILOT STUDY

We conducted an initial pilot study with firms in two four-digit SIC codes--electrical measurement instruments (SIC 3825) and surgical medical instruments (SIC 3841). One-hundred-eighty firms responded with usable surveys for a response rate of 17 percent. Exploratory factor analysis was used to explore the underlying dimensionality of the 17 items. Parallel analysis (Horn, 1965) was employed, along with a scree analysis (Cattell, 1966; Cattell & Jaspers, 1967) of the eigenvalues to determine the number of factors to extract from the data. Parallel analysis is a more conservative, and more accurate, approach to factor extraction that takes into account the biasing influence of sampling error (Velicer, Eaton & Fava, 2000; Zwick & Velcier, 1986). The method of parallel analysis described in Hayton et al. (2004) was employed to generate the factor retention criteria.

In brief, parallel analysis accounts for the impact that sampling error has upon observed eigenvalues when conducting factor analysis. The minimum eigenvalue equal to one criterion (Guttman, 1954; Kaiser, 1960; 1970) is only truly accurate when population data is being studied. For all other cases, sampling error leads to the inflation of eigenvalues such that the initial observed eigenvalues will be larger than one due to sampling error alone. Parallel analysis accounts for this by generating a large number of random data sets with the same parameters as the observed data (sample size, range of observed values). Each random data set is then factor analyzed and the mean of the eigenvalues from the randomly generated datasets is a good estimate of the effect of sampling error on data that has otherwise no underlying factor structure (i.e. is random). The eigenvalues of the observed data are plotted against the mean eigenvalues from the random data sets and only the factors with eigenvalues larger than those in the random data are retained. The theoretical rational, along with the method and interpretation of parallel analysis are described in detail in Hayton et al. (2004; see also Thompson & Daniel, 1996; Zwick & Velicer, 1986).

Preliminary data analysis revealed that the data were appropriate for factor analysis, the Kaiser-Meyer-Olkin measure of sampling adequacy was .737 and Bartlett's test for sphericity was significant (Chi-square 458.31, 66 d.f., p<.001). The results of the parallel analysis and scree analysis suggested that just three factors should be retained. Therefore, consistent with recommendations by Thompson and Daniel (1996) and others (Fabrigar et al., 1999; Zwick & Velicer, 1986) the preponderance of evidence suggests there are three factors underlying this data. What was immediately apparent is that causation items tended to load together, but effectuation items did not.

As a result of the pre-study we carefully analyzed the sub-components of effectuation and developed additional items to capture each of the sub-components as discussed above. The current iteration of the study learns from the previous iteration.

METHODS: MAIN STUDY

Sample

The sampling frame for the current study was selected from the 2005 Dun & Bradstreet directory, which contains information on over 132,500 companies (90% of which are private). The database contained contact information and secondary data such as three years of sales figures, employment figures, SIC Codes, and start-up date. We selected two four-digit codes—Plastic products (SIC 3089) and prepackaged software (SIC 7372). This resulted in a nation-wide sample frame of 1500 two to five-year old firms. We eliminated 354 firms because of bad addresses, resulting in an effective mailing list of 1146 firms. The selection of 2 to 5 year old firms was based on an assumption that start-up processes may take a year or two (or sometimes more). We truncated the age at 5 years to reduce the instability of recall data.

Survey Design and Data Collection

Following the Total Design Method (TDM) described by Dillman (2000), we mailed questionnaires, accompanied by prepaid return envelopes and cover letters, to the chief executive officers (chairman, CEO, and president) of the firms in the sample frame. The cover letters served to identify the sponsor of the study and to explain its purpose and importance. We assured executives of confidentiality and promised them a report of the aggregated findings once the study was completed. A follow-up postcard and reminder letter with a replacement survey questionnaire followed the initial mailing. One-hundred-ninety six firms responded with usable results for a response rate of 17 percent.

Our research uses responses from a single respondent in each company along with secondary data from Dun and Bradstreet. Some researchers question the validity of studies that rely on a single informant's perception. However, our approach of using one informant per organization has been supported when survey instruments were well designed and executed (Starbuck & Mezias, 1996), and the key respondent is the owner/manager of the business (Chandler & Lyon, 2001). In addition, frequently in new firms the lead entrepreneur is the only person with the requisite knowledge.

Responding firms averaged 3.8 years of age. They had a mean of 1.99 members in the management team and 14.42 full time equivalent employees. Forty-eight percent of companies stated that they were family businesses. Of the CEOs responding 79% were male. 56% of the responding companies were in the plastics products industry (SIC 3089), the remaining 44% were in the packaged software industry (SIC 7372).

Non-response bias is always a concern when response is voluntary; non-responding firms, however, did not differ significantly from responding firms on measures included in the Dun and Bradstreet data with respect to annual sales, geographic area, or SIC code.

Data Analysis

Descriptive statistics, internal consistency reliabilities, and intercorrelations of key variables in the study are displayed in Table 1. As can be seen in the correlation matrix, the various dimensions of causation and effectuation are relatively uncorrelated with each other with the average intercorrelation being a modest .054. While this provides preliminary evidence for the empirical uniqueness of the causation construct and the various dimensions of the effectuation construct, more robust evidence can be obtained from a confirmatory factor analysis.

Confirmatory Factor Analysis

To analyze the dimensionality of the causation and effectuation constructs, Confirmatory Factor Analysis (CFA) was conducted. Confirmatory Factor Analysis is especially well suited to determining the factor structure of latent variables because it provides a basis for comparing models with alternative factor structures (Kline, 1998). Following the recommendations of Byrne (2001), a multi-step approach

was taken to test the factor structure.   First, CFA models for several dimensional configurations are run, calculating fit statistics which help guide inferences as to how well each model fits the data. Second, the models are compared to determine which model best fits the observed data.

In the theoretical model proposed by Sarasvathy (2001), causation and effectuation represent two alternative approaches to entrepreneurship. In addition, effectuation can be operationalized in terms of several subdimensions. This structure will be tested by analyzing two sets of models: first-order and second-order.

In first-order models, the measures are assumed to be direct indicators of each latent variable. The first order models will be run for a single factor, two factors (causation and effectuation), and six factors (Causation, flexibility, experimentation, affordable loss, precommitments, partnering).

In the second-order models, the measures are assumed to be indicators of latent variables, which are then in turn, indicators of a second-order latent construct. The second order model will be run for the single factor and two factor models. The two factor model is shown in Figure 1.

Each model was evaluated in terms of its fit with the data. This evaluation is done using the chi-squared statistic and several fit indices. The chi-square gives an indicator of absolute fit, but is sensitive to sample size. The normed fit index (NFI), the comparative fit index (CFI) and incremental fit index (IFI) assess the fit of the model and the data by more conservatively comparing the hypothesized model to a standard, and with less sensitivity to sample size.   Values above .95 on these fit indices are conventionally treated as representing good fit (Bentler, 1992). In addition, the root mean square error of approximation (RMSEA) will be examined. Values of RMSEA between .10 and .08 represent a mediocre fit, between .08 and .05 represent a reasonable fit, and below .05 represent a good fit (Browne & Cudeck, 1993; Byrne, 2001; MacCallum, Browne, & Sugawara, 1996).

The confirmatory factor analysis results are shown in Table 2. The first step in evaluating the models is to determine their absolute fit. Reviewing the IFI, NIF, CFI, and RMSEA fit statistics reveals that the first-order models of causation and effectuation as a singular construct, and as a two-factor construct fit the data poorly, while the first-order model specifying six factors provided an good fit for the data $(\chi^2(155, N=196) = 221.75$, IFI = .942, CFI = .939, RMSEA = .047).   The second-order one-factor $(\chi^2(164, N=196) = 247.03$, IFI = .928, CFI = .925, RMSEA = .051) and two-factor models $(\chi^2(164, N=196) = 234.84$, IFI = .929, CFI = .926, RMSEA = .051) both fit the data reasonably well.

The second step is to evaluate the relative fit of the alternative models with a reasonably good fit as measured by the fit indices. The chi-squared difference test indicated that the difference in fit between the second-order one-factor and two-factor models is statistically significant $(\chi^2 = 12.19$, 2, p < .01), supporting the distinction between causation and effectuation as second-order factors. In addition, comparing this second-order two-factor model to the first-order six-factor model does not yield a statistically significant difference $(\chi^2 = 13.09$, 7, p < .07). This suggests that while three models provide a reasonable fit for the data, the second-order two-factor model and the first-order six-factor model provide a relatively better fit. Notwithstanding the apparent equality of the two models in explaining the observed data, there are two strong reasons to retain the theoretical distinction between the causation and effectuation process. First, the clear theoretical distinction between the two processes has been articulated persuasively by Sarasvathy (2001). There is no such similar argument for the merging of the constructs. Second, the pattern of correlations between causation and the dimensions of effectuation is consistent with viewing them as distinct phenomena It is important to note, however, that the effectuation process itself is composed of six moderately distinct phenomena. This supports the continued dimensionalization of the effectuation construct in future research.

DISCUSSION

Sarasvathy's (2001) model was based on grounded theory development. In her research she asked seasoned entrepreneurs to participate in a decision making exercise in which they made hypothetical decisions about venture start-up activities under several different scenarios. She did not develop specific measures for the different aspects of causation and effectuation. This research seeks to provide validating information for the causation and effectuation constructs, and to better understand how they relate to the venture development process, and each other.

Causation: As discussed earlier in the paper, causation processes are consistent with designed strategy and business planning models. A subjective analysis of the items included in our measure of causation is supportive of translation validity (face validity and content validity). On their face, the items appear to be measuring "causation." In addition, the items appear to capture the major components included in the causation construct. Sarasvathy (2001), states that in causation processes decision criteria were based on expected returns. She discusses competitive, analysis, designing and planning business strategies, and organizing and implementing control processes. Each of these ideas is included in an item that is intended to measure causation.

In our pilot study, items representing a causation dimension loaded cleanly onto the same factor, as they did in the current study. Thus, in two different data sets using somewhat different items, measures representing causation load cleanly onto the same factor and do not load with items intended to measure effectuation. The confirmatory factor analysis in both studies provides substantial evidence in support of the construct validity (both convergent and discriminant) of the causation construct. In addition, the causation construct is negatively correlated with uncertainty, an external criterion, as predicted by theory. In support of the internal consistency reliability of the measure, Cronbach's alpha, is .73, indicating adequate reliability for research purposes (Nunnally, 1978). Thus, there is strong support for a construct that can be titled "causation."

Effectuation: Effectuation processes are thought to be more consistent with an emergent strategy process (Mintzberg, 1978). In our pilot study, items intended to measure an effectuation process did not load cleanly onto a single factor. We concluded that effectuation was more likely a multidimensional construct. After reviewing Sarasvathy's (2001) work we identified six possible sub-dimensions of effectuation, and developed items to capture each sub-dimension.

From the perspective of translation validity (face and content), we believe we have captured the constructs as defined by Sarasvathy (2001). In general, the empirical results are supportive of our revised conceptualization of a multidimensional construct. However, one revision to the focus on resources sub-dimension may be warranted based on these results. According to Sarasvathy (2001) resources controlled constitute a starting point for decision making processes. Following her description, we wrote five items that reflected a focus on resources in the decision making process. However, these items double loaded strongly with causation items and did not discriminate between causation and effectuation. Upon reflection it became obvious that causation processes also evaluate resources. For example in SWOT analysis, we are taught to focus on internal strengths and weaknesses. Strengths and weaknesses are based on resources controlled. Thus, a focus on resources appears to be important to both causation and effectuation processes and does not discriminate between the two. As a result, it was omitted from our analysis.

Confirmatory Factor analysis provided evidence of the convergent and discriminant validity of the remaining measures. As can be seen from the correlation matrix in Table 1, there are relatively small levels of correlation among the sub-dimensions theorized to be part of the effectuation construct. However, items representing each of the sub-dimensions of effectuation load strongly on the target factor, and do not load on other factors. This provides evidence for the convergent and discriminant validity of the measures. The six factor first order model provides evidence of good model fit for scales that

represent causation, flexibility, experimentation, affordable loss, pre-commitments, and partnering. With the exception of our "pre-commitments" scale, which has a internal reliability of .62, coefficient alpha (displayed in table 1) for each dimension meets or exceeds the .70 referred to by Nunnally (1978) as being suitable for research purposes. Thus the combination of CFA and scale analysis provides fairly strong evidence supporting the internal consistency reliability and construct validity of our measures.

Given that effectuation is not a simple unidimensional construct, our next test was to see whether a confirmatory factor model represents effectuation as conceptualized by Sarasvathy (2001). In effect we tested whether the five factors we identified as part of effectuation (flexibility, experimentation, affordable loss, precommitments, and partnering) were best represented as five independent factors or as sub-components of a larger construct called effectuation. Goodness of fit tests for the second-order models indicate that the first order model and second order model fit the data similarly. Therefore, the results are somewhat inconclusive. In other words, the second order model with a latent construct that we have labeled effectuation, which is comprised of the components that Sarasvathy (2001) stated should be part of an effectuation process, does not fit the data better than a first order model in which the sub-components are presumed to be independent. Although it does not provide overwhelming support for a latent effectuation construct, the fit is strong enough for the second order model that it does not refute the model either. With respect to criterion related validity, only experimentation is significantly correlated with uncertainty as prescribed by Sarasvathy (2001). Thus, the experimentation part of effectuation is shown to be criterion valid, but the other parts of effectuation are not.

In summary, causation processes appear to be a well-defined and coherent set of practices that can be viewed as a unidimensional construct. Items representing causation loaded similarly in two separate data sets and have good internal consistency. In contrast, effectuation processes appear to be a loosely defined and only loosely related set of practices. The current research is inconclusive with respect to whether this set of practices can be referred to as "effectuation" in a meaningful way.

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REFERENCES

Achrol, R.S., & L.W. Stern. (1988) "Environmental determinants of decision-making uncertainty in marketing channels." *Journal of Marketing Research* 25(1): 36-50.

Allen, K. (2003) *Launching New Ventures: An Entrepreneurial Approach.* Boston, MA: Houghton Mifflin.

Bagozzi, Richard P., Youjae Yi, & L.W. Phillips. (1991) "Assessing construct validity in organizational research." *Administrative Science Quarterly* 36(3): 421-458.

Bartlett, M.S. (1950) "Tests of significance in factor analysis." *British Journal of Psychology, Statistical Section* 3: 77-85.

Baum, J. R., E.A. Locke, & K.G. Smith. (2001) "A multidimensional model of venture growth." *Academy of Management Journal* 44(2): 292-303.

Bentler, P.M. (1992) "On the fit of models to covariances and methodology to the Bulletin." *Psychological Bulletin* 112, 400-404.

Bentler, P.M. (1990) "Comparative fix indexes in structural models." *Psychological Bulletin* 107(2): 238-246.

Brown, M.W., & R. Cudeck. (1993) "Alternative ways of assessing model fit." In *Testing Structural Equation Models,* eds. K.A. Bollen, & J.S. Long, 136-162. Newbury Park: Sage.

Byrne, B.M. (2001) *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming*. New Jersey: Lawrence Erlbaum Associates.

Caplan, B. (1999) "The Austrian search for realistic foundations." *Southern Economic Journal* 65(4): 823-838.

Carraher, S.M., & M.R. Buckley. (1991) "The effect of retention rule on the number of components retained: The case of the Pay Satisfaction Questionnaire." Proceedings of the Southern Management Association.

Cattell, R.B. & J. Jaspers. (1967) "A general plasmode for factor analytic exercises and research." *Multivariate Behavioral Research Monographs* 3: 1-212.

Cattell, R.B. (1966) "The scree test for the number of factors." *Multivariate Behavioral Research* 1: 245-276.

Chandler, G.N., & D.W. Lyon. (2001) "Issues of research design and construct measurement in entrepreneurship research: The past decade." *Entrepreneurship Theory and Practice* 25(4): 101-113.

Chandler, G.N., & S.H. Hanks. (1993) "Measuring the performance of emerging businesses: A validation study." *Journal of Business Venturing* 8(5): 391-408.

Ciavarella, M.A., A.K. Buchholtz, C.M. Riordan, R.D. Gatewood, & G.S. Stokes. (2004) "The big five and venture survival: Is there a linkage?" *Journal of Business Venturing* 19(4): 465-484.

Cook, Thomas D., & Donald T. Campbell. (1979) *Quasi-Experimentation: Design and Analysis Issues in Field Settings*. Boston: Houghton Mifflin.

Dillman, D.A. (2000) *Mail and Internet Surveys: The tailored design method*. New York: Wiley.

Fabrigar, L.R., D.T. Wegener, R.C. MacCallum, & E.J. Strahan. (1999). "Evaluating the use of exploratory factor analysis in psychological research." Psychological Methods 4: 272-299.

Gorsuch, R.L. (1983) *Factor Analysis (2nd edition)*. Hillsdale, NJ: Lawrence Erlbaum.

Guttman, L. (1954) "Some necessary conditions for common factor analysis." *Psychometrika* 19: 149-162.

Hatfield, L., & John A. Pearce II. (1994) "Goal achievement and satisfaction of joint venture partners." *Journal of Business Venturing* 9(5): 423-449.

Hayton, J.C., D.G. Allen, & V. Scarpello. (2004) "Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis." *Organizational Research Methods* 7(2): 191-205.

Horn, J.L. (1965) "A rationale and test for the number of factors in factor analysis." *Psychometrika* 32: 179-185.

Kaiser, H.F. (1970) "A second-generation Little Jiffy." *Psychometrika* 35: 401-415.

Kaiser, H.F. (1960) "The application of electronic computers to factor analysis." *Educational and Psychological Measurement* 20: 141-151.

Kline, R.B. (1998) Principles *and Practice of Structural Equation Modeling*. New York: Guilford Press.

Kuratko, D.F., & R.M. Hodgetts. (2004) *Entrepreneurship: Theory, Process, and Practice*. Mason, OH: Thomson South-Western.

MacCallum, R.C., M.W. Browne, & H.M. Sugawara. (1996) "Power analysis and determination of sample size for covariance structure modeling." *Psychological Methods* 1: 130-149.

Mintzberg, H. (1978) "Patterns in strategy formation." *Management Science* 24(9): 934-948.

Nunnally, J.C. (1978) Psychometric *Theory*. New York: McGraw Hill.

Raven, P.V., J.M. Mccullough, & P.S. Tansuhaj. (1994) "Environmental influences and decision making uncertainty in export channels: Effects on satisfaction and performance." *Journal of International Marketing* 2(3): 37-59.

Sarasvathy, S. (2001) "Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency." *Academy of Management Review* 26(2): 243-263.

Scarborough, N.M., & T.W. Zimmerer. (2003) *Effective Small Business Management: An Entrepreneurial Approach*. Upper Saddle River, NJ: Prentice Hall.

Starbuck, W., & J. Mezias. (1996) "Opening Pandora's box: Studying the accuracy of managers' perceptions." *Journal of Organizational Behavior* 17(2): 99-117.

Stata, R. (2004) "New ways to evaluate innovative ventures." *MIT Sloan Management Review* 43(3): 96.

Timmons, J.A., & S. Spinelli. (2004) *New Venture Creation: Entrepreneurship for the 21st Century*. New York, NY: McGraw Hill/ Irwin.

Thompson, B., & L.G. Daniel. (1996) "Factor analytic evidence for the construct validity of scores: A historical overview and some guidelines." *Educational and Psychological Measurement* 56: 197-208.

Velicer, W.F., C.A. Eaton, & J.L. Fava. (2000) "Construct explication through factor or component analysis: A review and evaluation of alternative procedures for determining the number of factors or components." In *Problems and Solutions in Human Assessment: Honoring Douglas N. Jackson at Seventy*, eds. R.D. Goffin, & E. Helmes. Norwell, MA: Kluwer Academic Publishers.

Velicer, W.F. (1976) "Determining the number of components from the matrix of partial correlations." *Psychometrika* 41, 321-327.

Webb, Eugene H., & Karl E. Weick. (1979) "Unobtrusive measures in organization theory: A reminder." *Administrative Science Quarterly* 24: 650-659.

Zwick, W.R., & W.F. Velicer. (1986) "Factors influencing five rules for determining the number of components to retain." *Psychological Bulletin* 99: 432-442.

Table 1: Means, Standard Deviations, Reliabilities, and Correlations among Causation and Effectuation Constructs

Variable	Mean	SD	α	1	2	3	4	5	6
1.Causation	3.32	.85	.73						
2.Flexibility	3.98	.64	.70	.214**					
3.Experimentation	2.55	.94	.78	.063	.126				
4.Afford Loss	3.48	1.11	.85	.203**	.306**	-.065			
5.Precommitments	3.04	.88	.62	.387**	.111	-.030	.029		
6.Partnering	2.81	1.34	.86	-.016	.012	.062	-.114	-.094	
7.Uncertainty	2.84	.69	.66	-.245**	.042	.305**	-.092	-.188	.113

N=196, **p<.01

Table 2: Confirmatory Factor Analysis Fit Statistics for Alternative Models

Model	X^2	*df*	IFI	NFI	CFI	RMSEA
Null model	1312.17	190	-	-	-	-
First Order Models						
1-factor: First Order	943.78	170	.323	.281	.298	.153
2-factor: First Order	825.34	169	.426	.371	.405	.141
6-factor: First Order	221.75	155	.942	.831	.939	.047
Second Order Models						
1-factor: Second Order	247.03	164	.928	.812	.925	.051
2-factor: Second Order	234.84	162	.929	.814	.926	.051

Figure 1: Second-order Two-factor Model of Causation and Effectuation Processes