G. V. Shirokova, K. A. Bogatyreva, M. H. Morris

EXPERTISE, UNIVERSITY INFRASTRUCTURE AND COGNITIVE LOGIC: ASSESSING STUDENTS WHO START VENTURES

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Abstract: The present study explores how and why student entrepreneurs choose causal or effectual cognitive logic during venture creation and what role the university entrepreneurial infrastructure plays in this choice. We contribute to the existing literature on the contextual understanding of entrepreneurial decision-making by examining the role of business experience of student entrepreneurs in venture cognitive logic. Using the Global University Entrepreneurial Spirit Students’ Survey (GUESS), the study involves a sample of 2,324 student entrepreneurs from 26 countries. Our findings indicate that favorable university entrepreneurial environments and students’ involvement in networking and coaching are positively associated with a reliance on causal logic with inexperienced student entrepreneurs. With experienced student entrepreneurs, favorable university environments and participation in entrepreneurship courses, networking and coaching offerings are positively related to the proclivity towards effectual logic. Evidence is produced that effectuation and causation are orthogonal constructs that are intertwined and can unfold simultaneously.

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Galina V. Shirokova — Professor, Director of the Center for Entrepreneurship, Graduate School of Management, St. Petersburg State University
e-mail: shirokova@gsom.pu.ru

Karina Bogatyreva — Doctoral student, Graduate School of Management, St. Petersburg State University
e-mail: bogatyreva.karina@gmail.com

Michael H. Morris — James W. Walter Clinical Eminent Scholar Chair of Entrepreneurship Academic Director, Program in Entrepreneurship, Warrington College of Business Administration, University of Florida
e-mail: michael.morris@warrington.ufl.edu
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Expertise, University Infrastructure and Cognitive Logic: Assessing Student Who Start Ventures

Introduction

The entrepreneurial process has been considered by scholars through the lens of two cognitive logics: causation and effectuation (Chandler et al., 2011; Dew et al., 2009; Sarasvathy, 2001). Causal rationality begins with pre-determined goals and a given set of means (which can be augmented over time), with the entrepreneur seeking to identify and pursue the optimal alternative to achieve a given goal. Opportunities are taken as existing a priori, waiting to be discovered by the entrepreneur (Sarasvathy, 2001). Alternatively, effectual reasoning begins with a set of means and allows goals to emerge, with the means at hand being combined creatively or reconfigured by the entrepreneur to enable the venture to progress in new directions. Here, opportunities do not exist a priori but instead are created by the entrepreneur (Dutta and Thornhill, 2014).

Effectual logic is considered by some to be a paradigmatic shift in our understanding regarding the decision making process when starting a new business and acting under uncertainty (Perry, Chandler & Markova, 2012). Effectuation assumes individuals have different perceptions of the extent to which they consider the future as predictable and controllable, something which in turn will influence their decision-making logic (Sarasvathy, 2001). The specific context where entrepreneurs operate thus becomes a central factor in determining their preferences for effectual or causal reasoning during start-up and the same entrepreneur can prefer and use both causal and effectual logic depending on the specific circumstances. As a promising and fast-growing area of study, effectuation is still in its infancy (Perry, Chandler & Markova, 2012; Svensrud & Åsvoll, 2012). For instance, effectuation research focuses on answering open-ended questions without examining relations between various effectuation constructs and linking effectuation with other existing entrepreneurial theories. Thus, the antecedents and different conditions of effectual reasoning of entrepreneurs are understudied. In addition, effectuation theory has been criticised because it was developed from research on expert entrepreneurs, and so may be less representative of less experienced entrepreneurs (Perry, Chandler & Markova, 2012).

If we consider students, and particularly student entrepreneurs, there is evidence to suggest that the university infrastructure can provide a significant influence on their attitudes, behaviors and decision making processes (e.g., Dey, 1997; Hastie, 2007; Politis et al., 2012). Such influence comes from various sources, such as interactions with peers and faculty, as well as the general presuppositions, disciplinary paradigms and normative contexts of college cam-
puses (Politis et al., 2012). As such, one might question whether and how this infrastructure impacts the cognitive logic employed by student entrepreneurs. One viewpoint is that student entrepreneurs are exposed to courses and other influences that reinforce a planning approach to the start-up process and thus develop a preference for predetermined and specific goals, relatively greater use of formal business planning and a focus on securing complementary resources to reach these specific goals (Honig, 2004; Karlsson, 2005). An alternative viewpoint is that the university infrastructure presents opportunities for networking, knowledge sharing and creativity, which in turn stimulates cognitive processes that contribute to emergent strategy characterized by preferences for flexible goals, relatively little use of formal business planning and creative ways of acquiring resources needed (in line with Baron, 2006). Understanding how universities impact the formation of student entrepreneurs’ cognitive logic is of a particular importance in highly competitive and dynamic environments, as unstable and non-predictive settings can require a well-developed ability to pursue analogical reasoning associated with effectual logic.

The important role of prior business experience, and hence expertise, in entrepreneurial decision making research has been well-documented (e.g., Sarasvathy, 2001; Baron, 2009; Gabrielsson, Politis, 2011; Harms, Schiele, 2012). However, there appears to be a “missing link” in the literature regarding the way previous business experience might facilitate the influence of university entrepreneurial environment on venture cognitive logic of student entrepreneurs. To address this gap, this study draws from effectuation theory and a global data set to examine the relationship between university entrepreneurial environments, business experience and venture cognitive logic of student entrepreneurs.

The study contributes to existing effectuation theory and research on venture cognitive logic in at least two ways. First, we explore the relationship between university infrastructure and student entrepreneur’s preferences for causal and effectual logic during the venture creation process. Previous studies on effectual and causal logics have emphasized the contingent nature of entrepreneurial decision-making and the importance of context (e.g. Gabrielsson & Politis, 2011). We attempt to further develop this idea by emphasizing the role of student entrepreneurs’ business experience when interacting with the university infrastructure. We argue that some contingent factors per se are not necessarily the significant antecedents in entrepreneurial decision-making process; however, they may become significant once student entrepreneurs gain entrepreneurial or business experience.

Second, we develop theory-driven hypotheses and empirically test them using a large, international sample in order to improve our understanding of preferences for causal or effectual decision-making logic by non-expert novice entrepreneurs. Most research on effectual and
causal reasoning has been, with a few exceptions, conceptual in nature, or has been conducted in experimental settings (e.g. Dew, Read, Sarasvathy, Wiltbank, 2009); based on the sample of ‘average’ entrepreneurs (Gabrielsson, Politis, 2011), or on samples of student entrepreneurs from one country (Politis, Winborg, Dashlstrand, 2012).

The paper proceeds as follows. We first examine the extant literature and develop the theoretical foundation for the study. Based on this foundation, a research model and set of hypotheses are formulated. The research design for an empirical study in which these hypotheses are tested is then presented, followed by a discussion of the results. Implications are drawn for ongoing development of theory on effectuation as well as for the design of university entrepreneurship programs and entrepreneurial practice.

**Theoretical Background**

**Venture cognitive logics**

The theory of effectuation (Sarasvathy, Simon & Lave, 1998; Sarasvathy, 2001) introduces two modes of venture cognitive logics which individuals may apply when making decisions in business settings: causation and effectuation. Under causation-oriented logic, the entrepreneur employs a multistage process of opportunity recognition, development, and evaluation, with resource identification and feasibility assessment forming integral steps under the last stage. In contrast, the effectuation view of the entrepreneurial process begins with the resources available with the entrepreneur, and opportunities are created as possible effects (or outcomes) of what the resources can be deployed toward (Perry, Chandler, and Markova 2012). Causation-oriented cognitive logic assumes markets and opportunities to be objective and pre-existing, the entrepreneurial process as linear and unidirectional, and the targeted outcome as already known (being a desired goal). On the other hand, effectuation-oriented cognitive logic assumes markets and opportunities to be subjective and limited only by the entrepreneur’s imagination, the entrepreneurial process to be dynamic, interactive, and non-linear, and takes a set of means as given (Dutta and Thornhill, 2014).

Effectual and causal approaches may both be required at different points in the evolution of a venture, with the entrepreneur employing both logics interchangeably dependent upon the uncertainty of the circumstances (Gabrielsson & Politis, 2011; Sarasvathy, 2008). Effectuation, then, is not an inherently superior logic of reasoning but seeks to pluralize the concept of rationality by introducing non-predictive, non-teleological, and non-adaptive methods of decision making (Sarasvathy, 2001; Wiltbank et al., 2009).

The literature on expert decision-making demonstrates that trial-and-error experiences within a venture are the source from which experts develop much of their knowledge. In con-
Contrast, novices rehearse their skills in a more theoretical context, such as a “classroom” or in putting together a business plan for an intended venture, which are separated from the actual domain of decision-making (Dew, Read, Sarasvathy, Wiltbank, 2009). Previous studies suggest that novices trained in traditional management techniques based on casual reasoning will use a different logical frame in their decision-making and a different set of heuristics within the frame compared to expert entrepreneurs (Dew et al., 2009). Also, expertise is related to factors that result in framing decisions differently than do novices.

The acquisition of expertise is an area requiring further insights. More than simply having experience or individual talent, experts are thought to learn from intense, prolonged and highly focused efforts to improve their performance, which Baron and Henry (2010) label deliberate practice. Becoming an expert entrepreneur is thus thought to require repeated engagement in critical activities related to the entrepreneurial process (Greeno and Simon, 1988). A number of the critical activities associated with becoming an expert are practices that student entrepreneurs may be able to gain during university studies, such as “pitching” their venture ideas to potential stakeholders, applying for intellectual property protection, working on prototypes, negotiating with potential customers, and operating a venture in a student incubator. However, a recent review on entrepreneurship education program shows the many do not provide such opportunities for student entrepreneurs (Mwasalwiba, 2010). Students are often taught and are familiar with traditional methods of planning and analysis, which work well in stable environments where the future is likely to be similar to the present. These are environments where the future is assumed to fairly well known and understood. Yet, as the future become more unknowable, experimentation becomes more critical (Neck, Green, Brush, 2014). For this reason, prior business and start-up experience of nascent student entrepreneurs would seem a significant factor in explaining the cognitive logic in future entrepreneurial efforts.

University entrepreneurial infrastructure and cognitive logics

The question of how to educate people for entrepreneurship has become a topic of considerable discussion and debate (Dickson, Solomon, and Weaver, 2008; Morris, Kuratko and Cornwall, 2013). Entrepreneurial education seeks to prepare individuals for engagement in the entrepreneurial process, thus requiring development of particular competencies (Morris, Webb, Fu, Singhal, 2013; Williams Middleton and Donnellon, 2014). Recent reviews of teaching methods illustrates the complexity of entrepreneurship education, with various teaching methods focusing on different learning objectives (Morris, Kuratko and Cornwall, 2013; Mwasalwiba, 2010). Neck and Green (2011) explore three traditional ‘worlds’ that entrepreneurship educators generally teach in, and introduce a new approach for teaching entrepreneurship as a method. While we can see that some entrepreneurship programs provide knowledge for engag-
ing in the entrepreneurial process, some argue that most programs address knowledge about entrepreneurship in general or about the process of starting a new venture (Mwasalwiba, 2010; Williams Middleton and Donnellon, 2014).

Entrepreneurship education programs constitute a learning environment with an explicit or implicit teaching philosophy, set of learning objectives, pedagogy, curricular structure, and mix of co-curricular programming elements, among other components. The entrepreneurship literature has acknowledged that various environmental conditions have an impact on entrepreneurial behaviour and start-up activities. Tan, Tan & Young (2000) introduce the term ‘entrepreneurial infrastructure’ that relates to ‘the facilities and services present within a given geographic area which encourage the birth of new ventures and the growth and development of small- and medium-sized enterprises’. The university environment is an essential component of entrepreneurial infrastructure. It can influence entrepreneurial activities through providing entrepreneurship courses or full programmes in entrepreneurship and offering start-up coaching (see e.g., Pruett, 2012; Kuehn, 2008) or contributing to the activities of science parks or business incubators (McAdam & McAdam, 2008; Mian, 1997). In addition, university environment is an enormously rich pool of network relations (for instance, alumni networks) that entrepreneurs may use for various purposes (Skurczyński, 2008; McAdam & McAdam, 2006).

Despite the growing interest in entrepreneurship education and training across the globe, there is no consensus on the most important components of a quality model for a university entrepreneurship program (Matlay and Carey, 2007; Neck and Greene, 2011; Vanevenhoven and Liguori, 2013). Experimentation with various forms of experiential learning is widespread (e.g., Morris, Kuratko, and Cornwall, 2013), but traditional business planning activities are still embedded in many curricula (Honig, 2004; Neck and Greene, 2011). Moreover, these programs are generating both positive and negative outcomes in terms of students’ entrepreneurial intentions and the perceived attractiveness of an entrepreneurial career (e.g., Davidsson and Honig, 2003; Fayolle, Gailly and Lassas-Clerc, 2006; Souitaris, Zerbinati, and Al-Laham, 2007).

The decision to rely on effectuation is driven by both perceived uncertainty and experience (Harms & Schiele, 2012). Experienced entrepreneurs may, in predictable environments, choose to rely upon causal approaches, as they may perceive the benefits of formal planning under these conditions (Gruber, 2007), while in unpredictable environments, they are likely to place a primacy on effectual reasoning. Inexperienced entrepreneurs, like most student entrepreneurs, in favorable entrepreneurial university environments may find it easy to follow textbook-type causal logic. They might also realize the limitations of forecasting and rational planning in unfavorable environments, but because they lack experience, they are less likely to
adopt effectuation-based logic. There is evidence to suggest that student entrepreneurs are pressured to apply planning logic to the start-up process and thus may develop a preference for predetermined and specific goals, relatively great use of formal business planning and a focus on securing complementary resources to reach these specific goals (Honig, 2004; Karlsson & Honig, 2009).

The entrepreneurial situation for university students arguably differs fundamentally from the situations of the expert entrepreneurs (Sarasvathy, 1998). In general, student entrepreneurs are characterized as being individuals with little, if any, business knowledge, a limited network and under-developed skills at leveraging relationships, and little experience in how to act and make sense of the entrepreneurial process (Nielsen & Lassen, 2012). Yet, there are students possessing prior relevant business experience, who may have a richer appreciation of internal issues and requirements during the start-up process, and a better understanding of external resources and implications of developments in the environment. In non-predictive environments, these insights may help student entrepreneurs develop an ability to make decisions based on their experience rather than on textbook patterns they learn to rely upon at the university. Hence, task-specific experience is a key antecedent to the choice of either causation-based or effectuation-based logic (Harms and Schiele, 2012).

Dew with colleagues (2009) showed that experts are more likely to use analogical rather than analytical decision-making. Analogical reasoning is based on finding associations based on knowledge generated from personal experience. On the other hand, analytical reasoning is based on causal, logical, and hierarchical relations based on knowledge from language and formal systems, usually associated with explanation and formal analysis (Harms and Schiele, 2012), and widely used in business and entrepreneurship education programs around the world (Mwasalwiba, 2010; Williams, Middleton and Donnellon, 2014).

Based on this discussion, we propose the following hypotheses:

_Hypothesis 1a._ In a favorable university entrepreneurial ecosystem student entrepreneurs without previous professional experience related to their business are more likely to rely on causal venture logic.

_Hypothesis 1b._ In a favorable university entrepreneurial ecosystem student entrepreneurs with previous professional experience related to their business are more likely to rely on effectual venture logic.

Expertise entails certain common cognitive processes among those who solve problems within a given area of endeavor (Chi, Glaser, and Rees, 1982). Recent theorizing in entrepreneurship has proposed effectuation as a baseline model of entrepreneurial expertise that goes
beyond the “toolbox” of basic business skills such as market research, strategic management and business planning (Dew et al., 2011). If the decision makers believe they are dealing with a measurable or relatively predictable future, they will tend to systematically gather information and invest some effort in a reasonable analysis of that information, within certain bounds. Similarly, if they believe they are dealing with relatively unpredictable phenomena, they will try to gather information through experimental and iterative learning techniques aimed at first discovering the underlying distribution of the future.

The conventional paradigm on which traditional entrepreneurship education programs are built includes courses such as business planning, market analysis, feasibility analysis, and so forth (e.g., Barringer & Ireland, 2010). Although empirical research on the effectiveness of the business plan as a learning device has been mixed (Honig & Karlsson, 2004; Liao & Gartner, 2006), the business plan with its step-by-step rational process is a central component in most university entrepreneurship programs (Honig, 2004; Politis, Winborg & Dahlstrand, 2012). This approach to entrepreneurship education stresses analytical reasoning in the decision-making process. The findings of Roininen (2006) show that academic start-ups relied much more on formal business planning in comparison with start-ups not originating within the academic context. A study by Politis, Winborg & Dahlstrand (2012) suggests that student entrepreneurs who have pursued entrepreneurship programs of study become socialized into a certain way of thinking and behaving in relation to their preferences for how to secure and use resources in the process of starting up and managing a new firm.

On the other hand, students with prior experience engaged in professional relationships which helped create human capital by handing down the knowledge of ‘how to do business’ (Quan, 2012). Interactions with business professionals through conversations and observing them at the work place helps students gain needed knowledge on how to proceed when launching and running their own venture. Basing on these premises, we suggest the following hypotheses:

**Hypothesis 2a.** For student entrepreneurs without previous professional experience related to their business, the number of entrepreneurship courses a student has taken is positively associated with reliance on causal cognitive logic.

**Hypothesis 2b.** For student entrepreneurs with previous professional experience related to their business, the number of entrepreneurship courses a student has taken is positively associated with reliance on effectual cognitive logic.

The entrepreneurial situation for most university students differs fundamentally from that of the expert entrepreneurs who provided the grounding for effectuation theory (Sarasvathy, 1998). Student entrepreneurs are characterized as being individuals with little, if any, business
knowledge, few relations and little experience in how to act and make sense of the entrepreneurial process (Nielsen & Lassen, 2012).

Researchers have demonstrated that social networks can have a strong influence on the individual desire to become an entrepreneur and on the practical orientation of this desire (Davidsson & Honig, 2003; Morales-Gualdron & Roig, 2005; De Clercq & Arenius, 2006; Sequeira, Mueller & McGee, 2007). People who have social contacts with entrepreneurs also have strong desires to create their own businesses. As such, networking and coaching offered at the university have the potential to promote analogical rather than analytical reasoning, as analogical reasoning is based on knowledge generated from personal experiences.

According to Nielsen & Lassen (2012), in order to learn what it means for them to become entrepreneurs, students look for information on the Internet, read articles about entrepreneurs, and get inspiration from lectures and television; however, most students reach out to others in their search for meaning. For example, they try to get feedback from people with entrepreneurial experience in order to learn ‘who they can be’ within the world of entrepreneurship. Also, students turn to the university context, and this context is an especially important career-preparing context (Lannegrand-Willems & Bosma, 2006). They try to engage teachers and supervisors in their entrepreneurial activities, they participate in mentoring and coaching programs provided by the university, participate in business plan competitions and when possible use contact platforms with potential investors in order to discuss their entrepreneurial ideas. They engage in dialogue with various people within the university context to reach an insight and get feedback on ‘who they are as entrepreneurs’, and whether the being an entrepreneur is for them or not (Nielsen & Lassen, 2012).

As a result, the student entrepreneurial process constantly moves into new unexpected directions depending on the ongoing social interactions, and can facilitate student discovery of new opportunities and leveraging of contingences. Working with others to co-create opportunities is an additional aspect of effectuation logic, and pre-committed partners play an essential role as they expand the means of the effort, and can help specify and create markets tied to opportunities as they emerge over time (based on the student’s efforts) (Witbank, Read, Dew & Sarasvathy, 2009). Thus, entrepreneurial network relations represent the starting point of effectual action by constituting the “Who I know” part of the means set. In addition, they are also the necessary condition for the effectual process to unfold because they underlie its second principle – partnership and commitments instead of competitive analysis (Sarasvathy, 2001; Read et al., 2009).

At the same time, several studies demonstrate that network relations do not differentiate effectuation from causation, and both venture cognitive logics can be equally used (Chandler et
al., 2011; Geh, 2011). These findings have become the source of a major criticism of effectuation research, as network relations and strategic alliances do not differentiate effectuation as a discrete type of entrepreneurial behaviour (Chandler et al., 2011). Based on this discussion, we propose the following two hypotheses:

**Hypothesis 3a.** The level of networking and coaching offered through the university is positively associated with the use of both causal and effectual cognitive logic by student entrepreneurs without professional experience related to their business.

**Hypothesis 3b.** The level of networking and coaching offered through the university is positively associated with both causal and effectual cognitive logic used by student entrepreneurs with professional experience related to their business.

The overall theoretical model is presented in Figure 1.

![Figure 1: The theoretical model](image-url)
Research Methods

The Sample
In this study, we utilize data collected through the Global University Entrepreneurial Spirit Students’ Survey (GUESSS) 2011\(^1\). The Survey was launched at the Swiss Research Institute of Small Business and Entrepreneurship at the University of St.Gallen in 2003. Entrepreneurial attitudes, intentions, and activities of students on a global level represent the core focus areas of the Survey.

GUESSS is concerned with factors influencing future career choices with a particular stress on an entrepreneurial career. Building on the theory of planned behavior (Azjen, 1987), entrepreneurial intentions are approaches as outcomes of one’s attitude toward the behavior, subjective norms, and perceived behavioral control. The survey’s main aim is to examine whether current students are ready for an entrepreneurial career, what their intentions regarding a future career choice are, whether the entrepreneurial environment is strong among students, and what the student’s university provides for the development of entrepreneurial spirit. Apart from the university context, attention is also paid to students’ motivation and family background.

In 2011, 26 countries took part in the survey with 489 universities being involved. The sample includes 93,265 students, divided into three categories: students with no intention to found their own business, intentional founders and active founders. For the purpose of this study, we focus only on the group of active founders. This group includes those students who are already self-employed in their own founded company. This sub-sample accounts for 2,324 student responses. In our analysis, we divide this sub-sample into two groups: a group of the student entrepreneurs without previous professional experience related to their business (804 students) and a group of the student entrepreneurs with such experience (1520 students).

Measures for Variables

Dependent variables
‘Effectuation’ was measured with the seven-point Likert scale proposed by Chandler et al. (2011). The scale assesses four dimensions of effectuation: experimentation, affordable loss, flexibility and pre-commitment. The scale reliability holds at an appropriate level (see Appendix A). Exploratory factor analysis was used to validate the scale. Following the logic of Harms & Schiele (2012), we operationalize effectuation as an unweighted sum index of the factor scores of the items.

‘Causation’ was measured with the seven-point Likert scale proposed by Chandler et al. (2011). The scale reliability holds at an appropriate level (see Appendix A). Exploratory factor analysis was used to validate the scale. We operationalize causation with the factor score of the items (Harms and Schiele, 2012).

Independent variables

‘University entrepreneurial ecosystem’ is measured by a seven-point Likert scale comprising eight items. The scale was developed by Souitaris et al. (2007) and adapted for use in the GUESSS questionnaire. The scale reliability holds at an appropriate level (see Appendix A). Exploratory factor analysis was used to validate the scale. We operationalize university climate using an average estimate of all the respondents from a given university including both students-entrepreneurs and non-entrepreneurs.

‘Entrepreneurship courses’ is operationalized as the absolute number of entrepreneurship-related courses taken by a student that were both compulsory and elective. Sample courses include Introduction to Entrepreneurship, Family Firms, Financing Entrepreneurial Ventures, Technology Entrepreneurship, Social Entrepreneurship, Entrepreneurial Marketing, Innovation and Idea Generation, Business Planning.

\(^1\)http://www.guesssurvey.org
‘Networking and coaching offerings’ concerns entrepreneurship events or offerings providing platforms for establishing contacts with experienced entrepreneurs. More specifically, this variable was operationalized as the number of different types of entrepreneurship related events and offerings a student has participated in. Such events and offerings we mean workshops with entrepreneurs, organized networking events with entrepreneurs, contact platforms with potential investors, business plan contests and related workshops, mentoring and coaching programs with entrepreneurs, and contact points for entrepreneurial issues.

The ‘student business experience’ is assumed to influence the individual’s propensity to effectual behavior. We operationalize this variable with a dummy variable coded with 1 if a student has previous professional experience related to his or her business and 0 otherwise.

**Control variables**

A number of control variables were employed, including age, gender, education and country of origin. Individual entrepreneurial behavior, intentions and attitudes towards entrepreneurial processes may change with entrepreneur’s age (Laspita et al., 2012). Further, Carter et al. (2003), present evidence of gender differences in attitudes towards different aspects of the entrepreneurial process. Both general entrepreneurial intentions and attitudes toward entrepreneurial processes can vary across education fields (Laspita et al., 2012; Kristiansen & Indarti, 2004). Traditional business education may reinforce students acting rationally and employing analytical reasoning (Honig, 2004; Barringer & Ireland, 2010; Politis et al., 2012). Therefore, students in the business and management related fields of study may be more prone to causal behavior. We control for education with a dummy variable where 1 = ‘business and management related field’ and 0 = ‘other’. With regard to country of origin, effectual behavior is associated with dynamic environments with high levels of uncertainty, such as in emerging economies (Fisher, 2012; Sarasvathy, 2001). Therefore, we control for the development level of the country in which the student’s university is located. This variable is coded with 1 = developed country and 0 = emerging country according to the classification of the International Monetary Fund.

Descriptive statistics for the data are presented in Table 1, while the correlation matrix for the variables under study is presented in Table 2.

**Table 1: Descriptive statistics**

<table>
<thead>
<tr>
<th>№</th>
<th>Variables</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Causation</td>
<td>-3.13e-07</td>
<td>1</td>
<td>-2.008</td>
<td>1.645</td>
<td>2218</td>
</tr>
<tr>
<td>2</td>
<td>Effectuation</td>
<td>.0002904</td>
<td>2</td>
<td>-6.795</td>
<td>4.466</td>
<td>2135</td>
</tr>
<tr>
<td>3</td>
<td>University entrepreneurial ecosystem</td>
<td>4.102</td>
<td>1.516</td>
<td>1</td>
<td>7</td>
<td>2174</td>
</tr>
<tr>
<td>4</td>
<td># of entrepreneurship courses taken</td>
<td>2.426</td>
<td>2.258</td>
<td>0</td>
<td>8</td>
<td>1886</td>
</tr>
<tr>
<td>5</td>
<td>Networking and coaching offerings taken part in</td>
<td>1.251</td>
<td>1.457</td>
<td>0</td>
<td>5</td>
<td>1544</td>
</tr>
<tr>
<td>6</td>
<td>Age</td>
<td>26.953</td>
<td>4.857</td>
<td>17</td>
<td>38</td>
<td>1845</td>
</tr>
<tr>
<td>7</td>
<td>Gender</td>
<td>----</td>
<td>----</td>
<td>0</td>
<td>1</td>
<td>2324</td>
</tr>
<tr>
<td>8</td>
<td>Education field</td>
<td>----</td>
<td>----</td>
<td>0</td>
<td>1</td>
<td>2324</td>
</tr>
<tr>
<td>9</td>
<td>Country</td>
<td>----</td>
<td>----</td>
<td>0</td>
<td>1</td>
<td>2324</td>
</tr>
</tbody>
</table>
Table 2: Correlation Matrix

<table>
<thead>
<tr>
<th>№</th>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Causation</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Effectuation</td>
<td>.596* N=2098</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>University entrepreneurial ecosystem</td>
<td>.285* N=2083</td>
<td>.250* N=2009</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td># of entrepreneurship courses taken</td>
<td>.220* N=1805</td>
<td>.152* N=1736</td>
<td>.409* N=1774</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Networking &amp; coaching offerings taken part in</td>
<td>.222* N=1485</td>
<td>.167* N=1426</td>
<td>.384* N=1457</td>
<td>.567* N=1426</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Age</td>
<td>-.052** N=1759</td>
<td>-.024 N=1688</td>
<td>-.110* N=1727</td>
<td>-.071** N=1521</td>
<td>-.149* N=1273</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Gender</td>
<td>-.039 N=2218</td>
<td>-.040 N=2135</td>
<td>-.044** N=2174</td>
<td>-.082* N=1886</td>
<td>-.052** N=1544</td>
<td>.051* N=1845</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Education field</td>
<td>.139* N=2218</td>
<td>.094* N=2135</td>
<td>.186* N=2174</td>
<td>.272* N=1886</td>
<td>.166* N=1544</td>
<td>-.081* N=1845</td>
<td>-.065* N=2324</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Country</td>
<td>.093* N=2218</td>
<td>.016 N=2135</td>
<td>.034 N=2174</td>
<td>.078* N=1886</td>
<td>.015 N=1544</td>
<td>-.063* N=1845</td>
<td>.029 N=2324</td>
<td>.003 N=2324</td>
<td>1</td>
</tr>
</tbody>
</table>

Note:
* - correlation is significant at .01 level
** - correlation is significant at .05 level

Results

The hypotheses were tested with OLS regressions. The results suggest that both causal and effectual logic are associated with a number of the variables in the proposed model, with some interesting patterns, as illustrated in Tables 3 and 4. For the group of student entrepreneurs without any previous professional experience related to their business, a favorable university entrepreneurial ecosystem and student involvement with networking and coaching offerings had a positive impact on the propensity toward causal behavior (b=.113 and b=.090, both significant at the .05 level). The favorable ecosystem was also positively associated with effectual logic for the inexperienced students at the .001 significance level, but networking opportunities impact effectual logic only if the acceptable significance level is extended to .10. Taking more courses in entrepreneurship was not significantly associated with either causal and effectual logic for this sub-sample. Therefore, our findings provide support for hy-
hypotheses H1a and H3a and but do not support H1b. For the control variables, the results indicate negative effect of age in both the causation and effectuation models. Moreover, controlling for the developmental level of the university’s base country yielded a significant positive result in both models.

Table 3: University entrepreneurial infrastructure link to causation and effectuation in case of inexperienced student entrepreneurs

<table>
<thead>
<tr>
<th></th>
<th>Causation</th>
<th>Effectuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>University entrepreneurial ecosystem</td>
<td>.113 (.039)**</td>
<td>.286 (.084)**</td>
</tr>
<tr>
<td>Number of entrepreneurship courses taken</td>
<td>.025 (.024)</td>
<td>.019 (.051)</td>
</tr>
<tr>
<td>Number of networking and coaching offerings taken part in</td>
<td>.090 (.036)**</td>
<td>.141 (.078)*</td>
</tr>
<tr>
<td>Age</td>
<td>-.024 (.012)**</td>
<td>-.048 (.020)**</td>
</tr>
<tr>
<td>Gender</td>
<td>.104 (.093)</td>
<td>-.263 (.207)</td>
</tr>
<tr>
<td>Country</td>
<td>.252 (.120)**</td>
<td>.518 (.281)*</td>
</tr>
<tr>
<td>Education field</td>
<td>.131 (.090)</td>
<td>.148 (.186)</td>
</tr>
<tr>
<td>Constant</td>
<td>-.212 (.353)</td>
<td>-.416 (.624)</td>
</tr>
<tr>
<td>F-statistics</td>
<td>11.81***</td>
<td>8.32***</td>
</tr>
<tr>
<td>R-squared</td>
<td>.15</td>
<td>.14</td>
</tr>
</tbody>
</table>

*p<.1, **p<.05, ***p<.0001

As for the group of student entrepreneurs with previous professional experience related to their business, the results indicate a positive effect of a favorable university entrepreneurial ecosystem and of the students’ involvement in taking more entrepreneurship courses on the propensity for effectual behavior. (b=.196, .085 and p=.004 and .03, respectively). Taking advantage of networking and coaching opportunities was also associated with effectuation, but only at the .09 level. Contrary to expectations, we did not reveal any statistically significant effect of networking and coaching offerings on experienced students’ causal behavior. Therefore, our findings allow full acceptance of hypotheses H1b and H2b, and partial acceptance of hypothesis H3b. Moreover, the results of the regression analysis revealed a positive effect of university entrepreneurial ecosystem and students’ involvement in entrepreneurship courses on causal behavior of experienced student entrepreneurs (p=.000 for both), which we had not hypothesized. For the control variables in the case of experienced students, only the university base country developmental level demonstrated a significant positive result in the causation mode. This suggests that experienced students from developed countries exhibit a proclivity towards causation compared to their counterparts from developing countries.
Table 4: University entrepreneurial infrastructure link to causation and effectuation in case of experienced student entrepreneurs

<table>
<thead>
<tr>
<th></th>
<th>Causation</th>
<th>Effectuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>University entrepreneurial ecosystem</td>
<td>.118 (.03)***</td>
<td>.196 (.06)**</td>
</tr>
<tr>
<td>Number of entrepreneurship courses taken</td>
<td>.070 (.02)***</td>
<td>.085 (.04)**</td>
</tr>
<tr>
<td>Number of networking and coaching offerings student takes part in</td>
<td>.028 (.02)</td>
<td>.111 (.06)*</td>
</tr>
<tr>
<td>Age</td>
<td>.011 (.008)</td>
<td>.021 (.015)</td>
</tr>
<tr>
<td>Gender</td>
<td>.072 (.084)</td>
<td>-.053 (.159)</td>
</tr>
<tr>
<td>Country</td>
<td>.445 (.088)***</td>
<td>.264 (.201)</td>
</tr>
<tr>
<td>Education field</td>
<td>.127 (.077)</td>
<td>.009 (.161)</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.050***</td>
<td>-1.569**</td>
</tr>
<tr>
<td>F-statistics</td>
<td>14.40***</td>
<td>6.61***</td>
</tr>
<tr>
<td>R-squared</td>
<td>.13</td>
<td>.07</td>
</tr>
</tbody>
</table>

*p<.1, **p<.05, ***p<.001

Discussion

Most research into entrepreneurial decision making and venture cognitive logic is undertaken at the micro-level where the unit of analysis is individual entrepreneurs with their cognitions and emotions; with this focus, the question of how the contextual environment affects entrepreneurial behavior receives insufficient attention (Welter & Smallbone, 2011). The present study is a timely response to the growing recognition that venture cognitive logic cannot be studied without considering the environment in which it occurs. Because entrepreneurial infrastructure is a complex and multi-dimensional concept (Tan et al., 2000), in this research we examine just one side of its development – we study how university entrepreneurial infrastructure is related to venture cognitive logic used by student entrepreneurs.

We extend previous work on venture cognitive logic. The results of our study indicate that student cognitive logic can be not only causal, as previous studies comparing novice and expert entrepreneurs suggest (Read & Sarasvathy, 2005), but also effectual due to their prior business experience. Recent research demonstrates the role of start-up and industry experience in venture cognitive logic used by student entrepreneurs (Politis, Winborg, and Dahlstrand, 2012). These findings suggest that both start-up experience and industry experience are important building blocks in the development of effectual venture cognitive logic. The results of our study support this idea, indicating that specific knowledge and skills gained by
student entrepreneurs via professional interactions are related to the formation of cognitive logic.

Specifically, our findings show that favorable university entrepreneurial environments and students’ involvement in networking and coaching offerings are positively associated with reliance on causal logic by inexperienced student entrepreneurs. Causation is defined as a decision-making process that focuses on what ought to be done given predetermined goals and possible means. It relies on the use of analysis and estimation techniques to explore and exploit existing and latent markets (Sarasvathy, 2001), which in its essence implies a process that rests on the logic of prediction. Our findings are in compliance with prior literature and research in that student entrepreneurs, through their exposure to the university milieu, develop a specific logic characterized by a preference for predetermined and specific goals, make relatively greater use of formal business planning and focus on securing resources to reach defined goals (e.g. Politis et al., 2012). Many textbooks on entrepreneurship are implicitly or explicitly built around business planning models (e.g. Kuratko & Hodgetts, 2004; Timmons & Spinelli, 2004; Barringer & Ireland, 2010). Past studies (e.g Honig, 2004; Karlsson, 2005) have suggested that entrepreneurship programs and incubator milieus can encourage student entrepreneurs to conform to a largely predictive decision rationality through the institutionalized standard of strategic planning. Such practices, in turn, could be expected to influence the way inexperienced student entrepreneurs think and behave – such as generating and selecting means to create intended effects, seeking external capital, and relying in goal-oriented relationships to control resources in the new venture creation process (Dew, Read, Sarasvathy & Wiltbank, 2009).

We also find that in the group of experienced student entrepreneurs, a favorable university entrepreneurial ecosystem, student participation in entrepreneurship courses, and their involvement in networking and coaching offerings are positively related to the proclivity towards effectual behavior. Hence, in the case of experienced student entrepreneurs, all the elements of the university entrepreneurial infrastructure considered in this research have demonstrated a positive linkage to the proclivity towards effectual entrepreneurial reasoning. Therefore, prior business experience and the knowledge and skills related to it in a combination with favorable university entrepreneurial infrastructure fosters the development of analogical reasoning which may be of a paramount importance in the contemporary, ever-changing, non-predictive business environment. Yet, our results indicate that experienced student entrepreneurs in a favorable university entrepreneurial climate and that are involved in entrepreneurship courses will also pursue causal venture logic. This suggests that prior business experience may help develop abilities to decide on the relevant pattern of entrepreneurial
decision making upon the situation. Experienced entrepreneurs in predictable environments may choose to rely upon causal logic, realizing the benefits of formal planning under these conditions (Gruber, 2007), while in unpredictable environments, they are likely to rely on effectual logic as it is impossible to forecast the future.

The effectuation literature includes a considerable discussion regarding whether the constructs of causation and effectuation are opposite or orthogonal. Perry, Chandler & Markova (2012) stipulate that they are not the opposites on one continuum; and the inversion of causation does not necessarily means effectuation. Our study demonstrates that a generally favorable university entrepreneurial climate has a positive association with causal and effectual entrepreneurial logic with both experienced and inexperienced students. This finding supports the idea that causation and effectuation are orthogonal constructs (Perry, Chandler & Markova, 2012), and they are constantly intertwined and can unfold simultaneously (Sarasvathy, 2001).

Implications, Limitations and Future Research

We believe that our findings contribute novel insights and understandings to contemporary theory and research on effectual entrepreneurship and student venture cognitive logic. First of all, we provide empirical evidence showing that student entrepreneurs can adopt different logic in venture cognitive logic depending on the university context. Thus, entrepreneurship support in universities not only influences the number of student entrepreneurs but also the whether effectual or causal logic they use. Secondly, we show that in particular context non-expert entrepreneurs may use effectual reasoning in entrepreneurial decision making process. Thus we support previous studies on the importance of experiential learning in contemporary entrepreneurship education, where students can start experimenting, learn what works and then modify their experience during venture process. As shown in (Morris, Kuratko, and Cornwall, 2013b), experiential learning in entrepreneurship represents an attempt to move the educational focus away from a text-driven to activity-driven approach, from telling to showing, and from theory to the integration of theory and practice. Finally, we contribute to the discussion on nature of effectuation-causation continuum, arguing that causation and effectuation are orthogonal constructs, and they are constantly intertwined and can unfold simultaneously.

Our findings should be considered in the context of the study’s limitations. The first limitation is associated with the sample of the study which includes student entrepreneurs, the large majority of whom are non-expert entrepreneurs that have no or very little experience in venturing. This limits our ability to broadly generalize our conclusions for all student popula-
tion which may include experienced student entrepreneurs. A second limitation involves the need to capture more of the substance of what is taught and how it is taught in university entrepreneurship programs, both within the classroom and in co-curricular learning settings. Some universities may be, through their emphasis on innovative approaches to experiential learning, doing a better job of creating learning environments that more closely capture or mimic the realities of the entrepreneurial experience. Our third limitation deals with the inability to compare student entrepreneurs’ behavior in different institutional settings, particularly given that different economies may have their own unique issues and institutional pressures. Further research is encouraged to extend the present findings by exploring and contrasting the student entrepreneurs’ activities across different countries including emerging and developed economies. For example, in the international context, scholars could examine how, market conditions (i.e., turbulent or stable), the nature of the industry (i.e., emerging or established), the mode of operations (i.e., having a sales agent or building production facilities), level of institutional development, and so forth influence student entrepreneurs’ preferences for causal or effectual actions. The other research question to address is whether effectual entrepreneurs and their behaviour would differ from each other depending on countries and national cultures. Altogether, effectuation represents a promising and fast growing area of research; and we believe that studies on the above stated topics would help to move the field further to the intermediate stage of development.

**Conclusion**

The present study demonstrates that university entrepreneurial infrastructure constitutes an important part of the entrepreneurial environment, which, in turn, has a significant effect on entrepreneurial behavior and venture cognitive logic. Our findings indicate that favorable entrepreneurial ecosystems in universities, the level of students’ involvement in entrepreneurship courses, and the intensity of students’ participation at the networking and coaching offerings provided by universities, linked with students’ prior business experience, influence entrepreneurs’ adherence to either effectuation or causation. Although these findings shed light on both effectuation theory and understanding of the environmental conditions for entrepreneurial behavior, they lead to more questions that can be studied in the future research. For instance, it still remains unclear how and under what conditions effectual and causal strategies can occur simultaneously. Researchers within the area of entrepreneurial education can explore whether it is possible to teach potential entrepreneurs to act effectually and causally, or examine in more depth whether the adherence to either of the strategies is more tied to individual than contextual factors.
References


**Appendix: Operationalization of Latent Variables**

**a. Causation** (Alpha=.898; % of variance explained by one component=71.26; KMO=.877; Bartlett criteria: p<.000)

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I analyzed long run opportunities and selected what I thought would provide the best returns</td>
<td>.625</td>
</tr>
<tr>
<td>I designed and planned business strategies</td>
<td></td>
</tr>
<tr>
<td>I organized and implemented control processes to make sure we meet objectives</td>
<td>.750</td>
</tr>
<tr>
<td>I researched and selected target markets and did meaningful competitive analysis</td>
<td>.737</td>
</tr>
<tr>
<td>I designed and planned production and marketing efforts</td>
<td>.678</td>
</tr>
</tbody>
</table>

**b. Effectuation** (Alpha=.816; % of variance explained by four components=67.52; KMO=.815; Bartlett criteria: p<.000)

<table>
<thead>
<tr>
<th>Items</th>
<th>Component</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I experimented with different products and/or business models</td>
<td>Experimentation</td>
<td>.659</td>
</tr>
<tr>
<td>The product/service that I now provide is essentially the same as originally conceptualized</td>
<td>Experimentation</td>
<td>-.484</td>
</tr>
<tr>
<td>The product/service that I now provide is substantially different than I first imagined</td>
<td>Experimentation</td>
<td>.844</td>
</tr>
<tr>
<td>I tried a number of different approaches until I found a business model that worked</td>
<td>Experimentation</td>
<td>.787</td>
</tr>
<tr>
<td>I was careful not to commit more resources than I could afford to lose</td>
<td>Affordable loss</td>
<td>.849</td>
</tr>
<tr>
<td>I was careful not to risk more money than I was willing to lose with my initial idea</td>
<td>Affordable loss</td>
<td>.902</td>
</tr>
<tr>
<td>I was careful not to risk so much money that the company would be in real trouble financially if things did not work out</td>
<td>Affordable loss</td>
<td>.823</td>
</tr>
<tr>
<td>I allowed the business to evolve as opportunities emerged</td>
<td>Flexibility</td>
<td>.787</td>
</tr>
<tr>
<td>I adapted what I was doing to the resources we had</td>
<td>Flexibility</td>
<td>.717</td>
</tr>
<tr>
<td>I was flexible and took advantage of opportunities as they arose</td>
<td>Flexibility</td>
<td>.829</td>
</tr>
<tr>
<td>I avoided courses of action that restricted our flexibility and adaptability</td>
<td>Flexibility</td>
<td>.537</td>
</tr>
<tr>
<td>I used a substantial number of agreements with customers, suppliers and other organizations and people to reduce the amount of uncertainty</td>
<td>Pre-commitments</td>
<td>.783</td>
</tr>
</tbody>
</table>
I used pre-commitments from customers and suppliers as often as possible | Pre-commitments | .802

c. **University entrepreneurial ecosystem** (Alpha=.923; % of variance explained by one component=65.40; KMO=.916; Bartlett criteria: p<.000)

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>The University offerings I attended increased my understanding of the attitudes, values and motivations of entrepreneurs</td>
<td>.837</td>
</tr>
<tr>
<td>The University offerings I attended increased my understanding of the actions someone has to take in order to start a business</td>
<td>.860</td>
</tr>
<tr>
<td>The University offerings I attended enhanced my practical management skills in order to start a business</td>
<td>.862</td>
</tr>
<tr>
<td>The University offerings I attended enhanced my ability to develop networks</td>
<td>.825</td>
</tr>
<tr>
<td>The University offerings I attended enhanced my ability to identify an opportunity</td>
<td>.862</td>
</tr>
<tr>
<td>There is a favorable climate and premises for becoming an entrepreneur at my University</td>
<td>.792</td>
</tr>
<tr>
<td>At my University I found many entrepreneurial-minded classmates</td>
<td>.699</td>
</tr>
<tr>
<td>Thinking about any classes or training in entrepreneurship that you have had, were they mainly imparting knowledge (1) or could you work on own entrepreneurial ideas (7)?</td>
<td>.714</td>
</tr>
</tbody>
</table>