Causal vs. Effectual Behavior – Support for Entrepreneurs

Jan Schlüter[1], Dominik Schmitz[2],
Malte Brettel[1], Matthias Jarke[2], and Ralf Klamma[2]

[1] RWTH Aachen University, Lehrstuhl Wirtschaftswissenschaften für Ingenieure und Naturwissenschaftler, Templergraben 64, 52056 Aachen, Germany
{schlueter,brettel}@win.rwth-aachen.de
[2] RWTH Aachen University, Informatik 5, Ahornstr. 55, 52056 Aachen, Germany
{schmitz,jarke,klamma}@dbis.rwth-aachen.de

Abstract. "Effectuation" is a new approach to explain the success or failure of entrepreneurs. In contrast to the traditional "causation" approach the entrepreneur is not considered to be driven by a concrete goal and to choose between different alternatives in regard to how well they help to achieve this goal. Instead the entrepreneur evaluates the alternatives, in particular the choice of strategic partners, in regard to their potential for future success. The goals are adapted to the choices and in particular the needs of the strategic partners. Agent-based simulations are intended to help identifying the settings where one approach is more appropriate than the other.

1 Introduction

The IMP Boost project "Overcoming Barriers in the Innovation Process" investigates a new approach to explain the success or failure of entrepreneurs. At the center of interest is the notion of "effectuation" (http://www.effectuation.org) [6, 7]. This denotes a fundamentally different way to act in comparison to traditional approaches in economics, now denoted by "causation". A "causal" entrepreneur starts by carrying out comprehensive (and rather expensive) market studies to clearly identify a dedicated market opportunity. This is then settled as a goal and the entrepreneur only decides between different alternatives in regard to their utility to achieve the settled goal. In contrast to this an "effectual" entrepreneur is not committed to a particular product or goal, but only to the desire to run an enterprise. Instead of carrying out expensive market studies she chooses from alternatives in regard to the resulting opportunities and under consideration of the "affordable loss", i. e. how much money she can loose without harming her capacity to act. A major means of an "effectual" actor is to utilize her knowledge and network to find cooperation partners. These can be potential customers as well as money donators. Very much in contrast to the "causal" approach these strategic partners can have a great influence on the actual product or goal to be achieved. This is the "effectual" entrepreneur simply adapts the goal to the partner's needs, including the chance to build a completely different product.

The reward to this flexibility is a definite commitment of the partner to become a part of the new venture. Thus, the two approaches differ considerably in regard to how they address uncertainty. While the "causation" approach employs prediction to reduce uncertainty, "effectuation" controls the unknown future by taking decisions, i. e. explicitly deciding which way to go.

2 Objectives of the Research

The aim of the IMP Boost project is to compare the two approaches – causation vs. effectuation – by running simulations [8]. Based on theoretical research neither of the two approaches is to be favored in general. Accordingly, we need to identify the settings, conditions, and constraints that put either of these approaches in front.

From first modeling experiences and foundational considerations, agent-based approaches toward modeling and simulation seem to be well suited. To deepen the basic understanding of the two processes, we have first gone for a qualitatively oriented modeling with the help of the i^* framework. This approach builds on successful earlier experiences with modeling and simulating entrepreneurial networks with i^* [1–4]. Afterward for simulation purposes, we want to go beyond the qualitative logic-based simulations proposed in the earlier investigations, by considering quantitative simulations via the Repast agent-based simulation framework (http://repast.sourceforge.net). This allows for a more thorough investigation of a larger variety of parameter settings.

3 Scientific Contributions

3.1 A Process Model for "Causation"

Figure 1 shows a preliminary and partial modeling of a "causation" based approach toward venture creation (based on [5]). The main actors are the "entrepreneur", a "market research institute", and "resource providers", in most cases venture capitalists or business angels. As it becomes obvious from Fig. 1, the goal-orientation of the "causation" approach fits well with the traditional understanding and modeling of agents with beliefs, desires, and intentions. The only extension compared to vanilla i^* is the consideration of sequence links and a more general precondition/effect element (graphically depicted by a triangle) as introduced in [1].

3.2 A Process Model for "Effectuation"

In contrast to this the modeling of "effectual" behavior runs into some problems (see Fig. 2, again based on [5]). The "effectual" approach is to be considered goal-oriented only in a very generic way, such as "create a venture". The concrete business idea, if formulated as a goal, needs to be alterable over time. Further on, while the "causation" model is mainly sequential, effectuation inherently asks

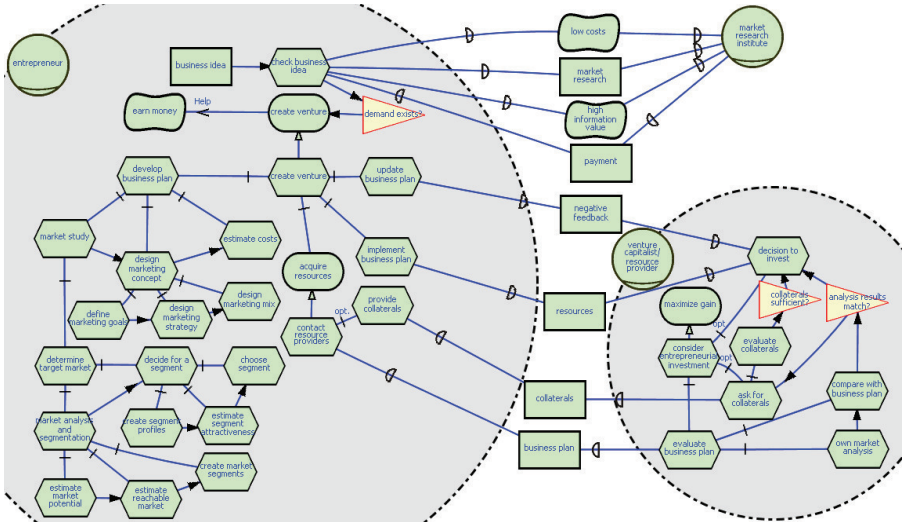

Fig. 1. Preliminary i^* Model for "Causation"

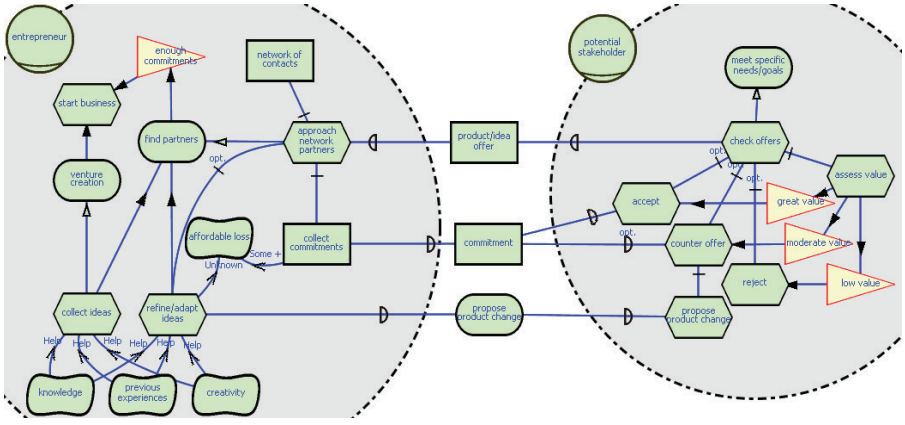

Fig. 2. Preliminary i^* Model for "Effectuation"

for loops. The new partners that are sought and from whom commitments are collected can change either the means – i. e. what is possible – or the goals – i. e. what the entrepreneur (concretely) strives for – at a product/widget level. Pre-existing contacts are visited one after the other and each can trigger the same processes on negotiating commitments and/or adapting products. Thus, not only the concrete goals can change dynamically. In just the same way, also more and more means become available, possibly after any new potential partners is contacted.

While there have been proposals to embed control loops into the i^* modeling language (see, for example, [10]), they focus the SR level, in particular decompositions. Thus, it has to be investigated whether these extensions are also suitable to capture repeated interactions between agents as occurring in this setting. Alternatively, a more strategic, high-level annotation of *dependencies* may be considered. Yet the more operationalized "control flow" considerations mentioned above might prove valuable when addressing the model-based transformation toward quantitative agent-based simulations.

3.3 Logic-Based Simulations

By referring earlier work on entrepreneurship networks [1–4] we plan to analyze "causation" and "effectuation" with the help of qualitative, high-level logic-based simulations. For this purpose we want to make use of an established model-based mapping from i^* to ConGolog, a logic-based simulation framework enabling concurrency. The particular process models in i^* as preliminarily proposed above are the first steps in this regard. Yet, we still have to investigate in how far the simulation framework and the existing transformation need to be reconsidered once departing from the focus on networks and trust issues therein.

3.4 Agent-Based Simulations

In regard to quantitative agent-based simulations first steps have been taken by manually implementing a simplified agent-based simulation model on top of the Repast agent-based simulation framework (http://repast.sourceforge.net/). The model has four key components: (1) product ideas – a feature vector with n elements, (2) three types of agents – causators, effectuators, and consumers, (3) market demand – demand vectors of all agents, and (4) a pay-off landscape to measure performance via market fit. To ease comparison, there are pairs of causator and effectuator agents with identical product ideas. During the simulations, the causator and effectuator agents then finalize their product ideas by filling the remaining flexible features. The causator uses a market study for this purpose while the effectuator relies on her network and the sequential negotiation of commitments with a rather small number of stakeholders that are consulted.

While this simple model does not yet have all the necessary features – for example, the principle of "affordable loss" is not yet considered –, it has already confirmed the basic theoretical results, for example, the role of uncertainty. But

at the same time the simulations have delivered more insights on the fine-granular details of the considered situations. In particular, they have revealed the need to consider the influence of market concentration and fragmentation on the superiority of either approach. For more details see [8].

4 Conclusions

The first findings of agent-based simulations are promising in that they confirm that the theory of "effectuation" is plausible. In particular, the important role of uncertainty is acknowledged. On the other hand, the current simple simulations do not correctly reflect all relevant features such as "affordable loss" or a more detailed investigation of the concerned network of contacts let alone its evolution over time (even beyond several different venture "attempts").

We expect refined *i** models to help increasing the foundational understanding and static characterization of the two approaches whereas logic-based simulations are foreseen to shed some light on the dynamic characteristics. The results of these investigations then need to be reviewed and applied to refine and improve the quantitative agent-based simulations in Repast.

Altogether we can summarize that first steps toward a better understanding of "effectuation" have been made. Yet more analysis and simulations need to be run to better understand and answer the question when which of the two approaches is highly-likely more valuable.

5 Ongoing and Future Work

Currently, we investigate, improve, and validate our *i** process models for causation and effectuation, in particular in regard to which necessary feature can only badly be represented in *i**. At this point, we are still open in regard to whether new features are needed in *i** or – as it currently seems – some minor extensions that have already been proposed by various authors over the years can be combined to suit the new setting. Further on, we need to consider alternative modeling approaches as well. As already for now, the agent-based simulations are pursued rather independently from the *i** modeling. Accordingly, other modeling approaches such as systemic dynamics etc. similarly can provide valuable input. Of relevance is only that any findings of these pilot modeling studies need to be analyzed to complete, refine, and improve the models for the agent-based simulations (in Repast).

To analyze simulation results and in particular due to the high importance of networking, approaches from social network analysis as well as actor-network theory are likely to become relevant in order to correctly evaluate and interpret the results (see also [9]). This might also establish an interesting feedback loop on (automated) adaptations of the *i** models to reflect the outcome or evolution of situations and settings throughout simulations. Further on, we need to calibrate and validate the simulations by referring historic real world data before being

able to derive guidance on the strengths and weaknesses of the two approaches in regard to various different possible settings.

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References

1. G. Gans, M. Jarke, S. Kethers, and G. Lakemeyer. Continuous requirements management for organization networks: A (dis)trust-based approach. *Requirements Engineering Journal*, 8(1):4–22, 2003.
2. G. Gans, M. Jarke, S. Kethers, G. Lakemeyer, and D. Schmitz. Requirements engineering for trust-based interorganizational networks. In E. Yu, P. Giorgini, N. Maiden, and J. Mylopoulos, editors, *Social Modeling for Requirements Engineering*. MIT Press, Cambridge, MA, 2011.
3. G. Gans, M. Jarke, G. Lakemeyer, and D. Schmitz. Deliberation in a metadata-based modeling and simulation environment for inter-organizational networks. *Information Systems*, 30(7):587–607, 2005.
4. M. Jarke, R. Klamma, G. Lakemeyer, and D. Schmitz. Continuous, requirements-driven support for organizations, networks, and communities. In J. Castro, X. Franch, A. Perini, and E. S. K. Yu, editors, *Proc. of the 3rd Int. i* Workshop, Recife, Brazil, February 11-12*, CEUR Workshop Proceedings, vol. 322, pages 47–50. CEUR-WS.org, 2008.
5. Christian D. Klusmann. Developing a process model for causal and effectual entrepreneurship (in german). Bachelor thesis, RWTH Aachen University, 2011.
6. S. D. Sarasvathy. Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review*, 26(2):243–264, 2001.
7. S. D. Sarasvathy and N. Dew. New market creation through transformation. *Journal of Evolutionary Economics*, 15(5):533, 2005.
8. J. Schlüter and M. Brettel. Simulating the clash of effectual and causal processes: Investigating conditions & boundaries for venture succes. In *Babson College Entrepreneurship Research Conference, Syracuse/NY, USA, June 8-11*, 2011.
9. D. Schmitz, T. Arzdorf, M. Jarke, and G. Lakemeyer. Analyzing agent-based simulations of inter-organizational networks. In L. Cao, A. L. C. Bazzan, V. Gorodetsky, P. A. Mitkas, G. Weiss, and P. S. Yu, editors, *6th Int. Workshop on Agents and Data Mining Interaction (ADMI@AAMAS), Toronto, Canada, May 11, Revised Selected Papers*, LNCS 5980, pages 87–102. Springer, 2010.
10. X. Wang and Y. Lespérance. Agent-oriented requirements engineering using ConGolog and *i**. In *Working Notes of the Agent-Oriented Information Systems Workshop, AOIS, Montreal, QC, Canada, May 28*, 2001.