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Entrepreneurship as Design and Design Science

The Journal of Business Venturing Design is premised on the idea that it is productive to consider entrepreneurship a form of design and entrepreneurship studies a design science. This introductory essay will attempt to clarify and relate these concepts. But before doing so, a few words about design and artifacts in general.

What is Design?

Reflecting long standing epistemological and moral distinctions between "is" and "ought" (Hume, 1739), scholars of engineering, medicine and other professionally oriented fields have long experienced tensions between, on the one hand, the pursuit of true descriptions and explanations[1] of natural phenomena and how they relate to one and other (e.g. nuclear physics) and, on the other hand, imperatives to produce instrumental knowledge of use when designing new artifacts (e.g. nuclear power plants or thermonuclear bombs) (Bunge 1975; Niiniluoto, 1993; Simon, 1996). The term natural here refers to things that are the way they are without any involvement of purposive designers. In contrast, artifacts are, at least in part, the result of purposive design. On this view, social sciences can also be seen as 'natural sciences' to the extent that their objects of study are conceptualized and studied as if they existed naturally (Berglund, Bousfiha, & Mansoori, 2020).

Unlike a natural thing, a designed artifact is not characterized in terms of its essential qualities but rather contingently, in terms of whether its internal character relates to its external environment in functional ways. The emphasis on artifacts also means that design cannot be conceptualized in terms of purposive individuals and environmental circumstances alone. Instead, design always "involves a relation among three terms: the purpose or goal, the character of the artifact, and the environment in which the artifact performs"(Simon, 1996: 5). To illustrate, the first maritime chronometer (artifact) used counter-oscillating weighted beams connected by springs (internal character of the artifact) to enable timekeeping on rolling ships (external environment in which the artifact is to perform). In contrast, pendulum clocks (or sundials) were not clocks *qua* functional artifacts when placed on rolling ships. "Whether a clock will in fact tell time depends on its internal construction and where it is placed. Whether a knife will cut depends on the material of its blade and the hardness of the substance to which it is applied." (Simon 1996: 6). Whether a venture will be profitable or grow depends on its internal organization and the character of its environment.

These general reflections on design and artifacts suggest two quite different implications for entrepreneurship research. First, it suggests that it is fruitful to conceptualize entrepreneurship as a form of artifact-centered design. Just as engineers design cars and architects design buildings, so can entrepreneurs be said to design ventures. Second, it suggests that it is fruitful to regard entrepreneurship studies[2] as a design science whose ultimate, albeit not always immediate, aim is to develop instrumental knowledge. These will be discussed in turn.

Conceptualizing Entrepreneurship as Design

Building on the triadic account of design as involving purposive individuals who make artifacts that should function in given circumstances (Simon, 1996; cf. also Bunge, 1966; Hansson, 2007; Niiniluoto, 1993; Vincenti, 1990), entrepreneurship as design can be defined as the purposive, gradual, and uncertainty facing process of establishing a new venture (or "business", "opportunity", "startup", "organization" etc.) given environmental circumstances, which are themselves sometimes transformed as part of the process (Berglund et al., 2020).

Defined in this very general sense, the design perspective extends the dominant dual nexus framework with its emphasis on enterprising individuals and environmental circumstances (Shane & Venkataraman, 2000) into an artifact-centered design triad. Seeking to make sense of entrepreneurial ventures and practices within the confines of the dual nexus framework, scholars have proposed a range of specific concepts that sit rather uncomfortably between individual and environment, such as *new venture ideas*, which are "imaginary combinations of product/service offerings, markets, and means of bringing these offerings into existence" (Davidsson, 2015: 675), or *symbolic blueprints*, which "epitomize the symbolic aspect of the interaction between entrepreneurs and their environments" (Dimov, 2011: 62). Lacking allegiance to academic frameworks, practitioners tend to speak much more clearly about the centrality of "minimum viable products" (Ries, 2011), "pretotypes" (Savoia, 2019), and "business models" (Osterwalder & Pigneur, 2010) as the means by which founders iteratively test their visions and design their ventures to fit with environmental circumstances (cf. Berglund & Glaser, 2021).

As entrepreneurship research has developed both empirically and conceptually, it has become increasingly clear that efforts to subsume everything under the dual nexus framework is quite problematic (cf. Davidsson, 2021). Extending the dual nexus to an artifact-centered

[1] Explanation is a subset of description, namely descriptions of mechanisms that bring phenomena about.

[2] Here I have in mind entrepreneurship as a quite practically oriented management discipline.

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triad will hopefully enable more conceptually clear, more empirically tractable, and more practically relevant theory. As a side note, the idea of achieving theoretical simplicity by introducing slightly more complex building blocks is not new. A classic example is found in Copernicus' stubborn insistance that planetary movements should only be modelled in terms of 'divine' circles, which led to increasingly complex and contorted theories. Only when Kepler introduced a new and slightly more complex conceptual building block, namely the ellipse, could the detailed observations of the planetary system be modelled in a simple and useful way.

Sketched in this way, the design triad provides a very general framework that should have potential to produce more analytically clear and empirically precise work. To accomplish this and put meat on the skeletal bones of the design triad, inspiration can of course be found in many places. In addition to Simon's work, several contributors to the inaugural issue found the work of Donald Schön (1983) to be particularly valuable. Greatly inspired by John Dewey's pragmatist theory of inquiry (1938), Schön provides detailed examples and a rich conceptual apparatus to help us understand design as a probing and frame-reflective conversation with concrete artifacts, such as sketches and models, as well as the 'problematic situations' of which they are part. The individual papers are briefly summarized below.

Bianchi and Verganti fear that understanding design primarily as rigorous problem solving may blind us to the fact that problems themselves are often designed. Building on Schön as well as Dorst (2015) they show how meaningful problems can be designed by generating and making sense of novel interpretive frames.

Glaser and Lounsbury also use Schön's work to show how our understanding of cultural entrepreneurship can be enriched and made more prescriptive by treating entrepreneurs as 'designers of legitimacy' who artfully prototype and iterate stories in ongoing dialog with various audiences.

Garud also sees stakeholder dialogue as central to entrepreneurship. Illustrated using Uber's entry into multiple markets, he proposes a performative perspective on entrepreneurial design, in which artifacts, as well as the worlds in which they may exist, are constituted through the sayings and doings of heterogeneous actors.

Packard, Bylund and Klein criticize what they take to be Herbert Simon's overly material and rational account of design and sketch a subjectivist Austrian theory of design claiming, somewhat provocatively, that "entrepreneurship theory is itself uniquely Austrian (there is no non-Austrian theory of entrepreneurship), and thus so must be its design-based origins."

Dimov uses insights from philosophy of mind and language to distinguish *"opportunity"* as the propositional content of an entrepreneurial intention, and *opportunity* as the agent-independent conditions of an intention's satisfaction. Based on this, he suggests several implications for how entrepreneurship may be conceptualized as well as researched, including as an instrumental design science.

Seckler, Mauer, and vom Brocke seek to philosophically ground and provide practical guidance for design science research in the entrepreneurship field. Inspired by Mario Bunge's philosophy of technology (1996) and methodological contributions from the information systems field, they cover a broad range of issues to guide scholars aiming to produce knowledge that is both scientifically grounded and practically useful.

Sarasvathy's paper in many ways exemplifies such grounded and useful design knowledge. Identifying 'the ask' as key to entrepreneurial expertise, she combines existing theory with unpublished studies to propose a typology of asks and several teachable principles that may be used to guide entrepreneurial action and, with deliberate practice, to develop entrepreneurial expertise.

Taken together, the papers in the inaugural issue illustrate how entrepreneurial design as a general framework can be turned into more concrete conceptualizations. Several papers, especially the ones by Dimov, Sarasvathy, and Seckler et al. also elaborate on how entrepreneurship may be researched as a design science, an issue discussed next.

Researching Entrepreneurship as a Design Science

In addition to conceptualizing entrepreneurship as a form of design, JBVD is committed to a design science perspective on entrepreneurship. This does not mean that descriptive and explanatory research will not be published. Quite the contrary, the majority of papers will likely be of this kind. However, the ultimate goal of all such contributions should be the development of useful design knowledge. Stated differently, to be considered for publication, descriptive research should be of a kind that allows for and aims toward the development of practically useful design knowledge and tools.

To clarify what is meant by design science and useful design knowledge, it is instructive to reflect on: the general position of design science between descriptive science and entrepreneurial practice, how design knowledge relies on both scientific grounding and practical evaluation, and how design theory must trade off epistemic and practical utilities.

Design science between descriptive science and concrete practice

Design sciences, such as engineering, management, architecture, and medicine are concerned with developing scientifically grounded and field-tested knowledge of use to particular professions or fields of activity (van Aken, 2005; Van Aken & Romme, 2009). As such, design sciences can be positioned in between the descriptive and explanatory sciences on whose knowledge they often build, and the concrete practices of the professionals they seek to support (Berglund, Dimov, & Wennberg, 2018). Here it is important to clarify that the knowledge produced in design sciences tends to take the form of prescriptive design principles or "technical norms" that are not evaluated in terms of their truth values, but rather in terms of their practical utility in light of certain goals (Bunge, 1966; Niiniluoto, 1993).

Positioning design science between descriptive sciences and concrete practices also helps clarify how such knowledge can be developed. Stated very generally, prescriptive design knowledge can be based on descriptive knowledge and developed from the "top down" or based on concrete practice and developed from the "bottom up" (Niiniluoto, 1993).

The top-down approach means that descriptive theories, e.g. in the form of explanatory mechanisms on the form "X causes A in situation B", can turned into prescriptive design principles on the form "if you are in situation B and want A, do X". A classic example is Michael Porter's five forces framework, which used microeconomic explanations of industry level monopolies, oligopolies, 'perfect competition' etc. as the basis when developing prescriptive design principles and tools in the context of firm strategic management (Porter, 1981). In general, the kind of descriptive knowledge that is most valuable for developing managerially relevant design knowledge centers on human action and interaction, or more generally provides the kind of description or explanation that can be used to formulate managerial prescriptions. Individual variables and social forces are not causal agents and are therefore not as easy to use as the basis for design principles (Hedström and Swedberg, 1998).

Note that top-down development of design principles is really only possible only if X can be manipulated, e.g. firms can reduce competition by erecting barriers to entry. However, if this is not possible, the causal mechanism can still be practically valuable by enabling predictions that let us take action. An example is when meteorological predictions let us evacuate danger zones before extreme weather hits. In entrepreneurship, understanding mechanisms that link ADHD to entrepreneurship may similarly be used for "designing effective intervention strategies to make best use of advantages and bypass disadvantages" (Wiklund, Yu, Tucker, & Marino, 2017: 644).

Since established lawlike mechanisms are quite rare in the social sciences, design science research often relies on bottom-up approaches

such as the close examinations of individual cases. Ideally, such analyses are used to gradually develop useful models of phenomena or processes of interest, on the basis of which trial-and-error and experimental tests are used to identify critical dependencies and evaluate the effects of various interventions (Niiniluoto, 1993). Such bottom-up development of prescriptive design principles is quite common also in the history of the natural sciences. A classic example is how blacksmiths and other tinkering 'men of practice' often developed useful principles for steam engine design before 'men of science' could explain why they worked in terms of thermodynamics (Mokyr, 1992). In entrepreneurship, the theory of effectuation is a good example of a prescriptive design theory that has largely been developed from the bottom up through close analyses of entrepreneurial practitioners (Sarasvathy, 1998).

While the development of useful design knowledge often develops primarily from the top down or bottom up, in practice scholars typically combine the two when developing useful design theory (Hansson, 2013; van Aken, 2005).

Developing Design Theory

While valuable—and quite sufficient for publication in Journal of Business Venturing Design—the end goal should not be design theory that is deductively derived but never practically evaluated, nor inductively developed but never scientifically explained. Instead, design knowledge should ideally be both scientifically grounded and practically field-tested (van Aken 2005, cf. Seckler et al. this issue). Scientific grounding here means that design knowledge is plausibly explained in terms of the mechanisms on which they operate. It does not mean that unexplained design knowledge—such as the early principles for steam engine development—cannot be very valuable. Clearly, they can. It only means that we do not know why or whether it works.

Therefore, it is an important task of design science to use rigorous methods to investigate the mechanisms (if any) underlying entrepreneurial practices and to use these insights to propose more useful design knowledge. To shun this task and let various 'prescientific' practices (e.g. industry best practices) proliferate without any attempt to explain how they work (or not) would not only be a form of professional neglect, it would also be a missed opportunity. Just as steam engine technology developed in tandem with, and benefitted greatly from, the emerging science of thermodynamics, practical design knowledge and tools can be greatly improved if researchers are able to discriminate between relevant and irrelevant explanatory factors, and then use this to improve design principles and tools, and so on. Bunge illustrates this point with characteristic clarity and wit:

> "A theory is a system of hypotheses, and it is enough for a few of them to be true or nearly so in order to be able to entail adequate consequences if the false ingredients are not used in the deduction or if they are practically innocuous. Thus, it is possible to manufacture excellent steel by combining magical exorcisms with the operations prescribed by the craft—as was done until the beginning of the nineteenth century. And it is possible to improve the condition of neurotics by means of shamanism, psychoanalysis, and other practices as long as effective means, such as suggestion, conditioning, tranquilizers, and above all time are combined with them." (Bunge, 1966: 334)

An example from the entrepreneurship field is the current work to improve the pragmatic design principles developed by Steve Blank, Eric Ries and other members of the Lean Startup movement. Specifically, the ambition is to transform the 'prescientific' Lean Startup principles into a body of design knowledge that is both scientifically grounded in established theories such as real options, organizational learning, and technological evolution (e.g. Contigiani & Levinthal, 2019) and on the basis of this refined and field-tested (Camuffo, Cordova, Gambardella, & Spina, 2020). Interestingly, Steve Blank's original formulation of Customer Development (Blank, 2004) was partly inspired by MacMillan and McGrath's discovery driven planning (1995), which in turn drew on options theory. Iterative and in between indeed.

Abductive and phenomenon-based theory development of this kind is very much encouraged in Journal of Business Venturing Design. But, again, the ultimate goal should not be to describe or explain a phenomenon or activity, but to use such descriptions and explanations to develop more useful design knowledge. To clarify the distinction, a few words on how to balance different theoretical utilities.

Tradeoffs when formulating design theories

Theories have different utilities that sometimes need to be actively balanced (Kuhn, 1977). Descriptive and explanatory theories generally aim for *epistemic utilities* such as simplicity, unifying power, explanatory power and most notably truth (or at least truthlikeness). Building on Thorngate (1976), Karl Weick (1979) thus argued that theories explaining social behavior cannot simultaneously be simple, general, and accurate. One must be sacrificed to get the other two. For instance, rational choice theory achieves simplicity and generality at the cost of accuracy. Design theories, however, must explicitly consider economic, ecological, aesthetic, moral and other *practical utilities* since these determine how useful the theory is considering the design purposes for which it is developed.

To illustrate, while Einstein's theory of gravity is clearly more truthlike, we still rely on Newton if our goal is to calculate trajectories of footballs or missiles, because it is sufficiently true for our purposes, but much more practical to use. However, since time on a satellite orbiting earth advances a little faster compared to on the ground, Newton's theory is not sufficiently accurate for the practical purposes of the global positioning system. Similarly, when working to improve the steam engine, James Watts' goal was "making engines cheap as well as good" (quoted in Mokyr, 1992: 87). Clearly, design principles for achieving these dual goals can never be a simple matter of applying thermodynamics.

In the field of entrepreneurship, the business model canvas illustrates similar tradeoffs. Developed as part of a design science dissertation in the field of information systems (Osterwalder, 2004), the 'business model ontology' traded off the goal of accurately describing the increasing variety of e-business models with the very pragmatic goal of being easy to understand and of providing "the foundation for subsequent concepts and tools, possibly computer based?" (Osterwalder, 2004: 2).

Coda

In sum, Journal of Business Venturing Design considers entrepreneurship to be a form of design and the field of entrepreneurship studies to be a design science. To help guide potential authors, this essay has sought to elaborate on these topics. The papers included in the inaugural issue should also provide some guidance in this regard. However, the gradual and uncertainty facing process of establishing this journal will inevitably be the result of editorial as well as author purposes. It will also take place within an existing academic environment, which will hopefully be transformed in some small part as a result of the process.

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