BOOK SECTION
Brenner, W. and Uebernickel, F. 2016.
Design Thinking for Innovation. Springer,

Designing from the Future

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In the last decade we have witnessed vibrant interest in design thinking that certainly has surpassed other important debates in management, such as on disruptive innovation or business model innovation.[1] This development is remarkable insofar as research on design thinking is still in its infancy, generally lacking in robust findings. Moreover, the great outpouring of interest has rather simplified our current knowledge of design thinking, instead of deepening our understanding of its operative nature and possible applications. The purpose of this article is to take stock of design thinking by pinpointing a central feature that has been explicated, but not consistently developed further within current debates on the subject. I sense a great necessity to restate design thinking in ways that make it more future-oriented and less of a process that embraces today's immediate challenges. This key enhancement provides a basis upon which to build future research that can offer a wider scope of application of design thinking and direct attention to leadership required to embed design thinking in organizations, to create desired futures for business or society as a whole.

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[1] *Google Trends* or references listed in *Google Scholar* portray an impressive picture!

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Introduction

In the last decade, design methodologies gained extensive attention beyond the disciplinary boundaries of the field. In particular there has been a great outpouring of interest on the part of corporate executives and management scholars who see in the designer's creative-analytical mode of operation, in his or her way of thinking, a strong and even unique potential for business innovation. As a matter of fact, design thinking has been viewed as the next competitive advantage (Martin, 2009a). Beyond its well-known capacity in the process of envisioning new opportunities to unleash collective imagination (e.g., Lockwood, 2010; Roam, 2009; Ware, 2010), scholars particularly consider design thinking as a powerful tool to boost innovation (e.g., Brown, 2008, 2009; Kelley, 2004; Kelley & Littman, 2005; Shamiyeh, 2007b, 2010, 2014; Verganti, 2009) and to formulate business strategies (e.g., Boland & Collopy, 2004; Liedtka, 2000; Lockwood & Walton, 2008; Shamiyeh, 2007a).

Nevertheless, while the extensive literature contributes much to our understanding of possible applications of design thinking to achieve key business objectives, there remains an ambiguity about the nature of design thinking in the context of management. Contrary to debates in the design disciplines on the particular nature of design methodologies (e.g., Buchanan, 1992; Cross, 1993; Fuller & McHale, 1963; Jones & Thornley, 1963; Lawson, 1980; Rowe, 1991; Spillers, 1974), in the field of management it is still not clear whether theory related to "design thinking" – a quite recent label – is grounded on the thorough examination of a designer's cognitive processes, his or her mode of reasoning and decision-making, or on a designer's actual mode of operation, the way of giving form to a particular problem. Significantly, despite this lack of clarity there seems to exist broad consensus about the key role of observation in the design thinking process (Brown, 2009; Kelley, 2004; Kelley & Littman, 2005; Plattner, Meinel, & Weinberg, 2009): Viewed as an

activity similar to that of an anthropologist who develops empathy for people by watching their actual experiences in the context of artifacts (physical spaces, products, etc.) and services, observation discerns what people really want rather than delivering quantitative data about known circumstances, as in conventional market research. It involves the design thinker in the immediate circumstances people encounter every day and thereby becomes a primary source for insights that inform the design process.

The benefit of design thinking's emphasis on observation in the creation of new business solutions is obvious. For a long time it was common in management practice and education to solve current problems, not by observation, but by inferring from the past. That is to say, on the basis of past experiences, the problem solver investigated and evaluated a series of alternatives with the support of scientific or empirical methods to finally come to a decision for further actions (Fink, 2003). Such a problem-solving approach, management scholars have come to understand, entails a problematic limitation: It suggests that the analysis of past conditions will provide the perfect solution for a current prevailing condition (Boland & Collopy, 2004; Martin, 2009b; Shamiyeh, 2007a).

On the contrary, observation – the study and embrace of immediate circumstances in the here and now – triggers a creation or "design" process of new and appropriate alternatives, rather than their discovery in the past. It is in this sense that men and woman running businesses have begun to understand that in the face of the increasingly diverse complexities of our world, design thinking in which observation takes center stage, can be a powerful tool for adapting businesses to actual market developments.

But it is the purpose of this paper to show that it is precisely today's overemphasis on observation that puts obscures the powerful capacity of design thinking to create futures that people truly desire, in-

stead of creating solutions in response to immediate circumstances people encounter today. IDEO's often-cited shopping cart project, first aired on July 13, 1999 on *ABC News*, is a case in point.

By observing customers' behavior in improvising to find their way through a supermarket, IDEO's design team drew a series of conclusions in regard to the design of a more convenient shopping experience (possible in the given context of a supermarket). The design firm's deep empathy for consumers – fueled particularly by watching what customers didn't do or by listening to what they didn't say – led to the design of a new shopping cart that invited customers to a new shopping experience. The design team matched need to demand. However, the case also exemplarily reveals that the approach failed to initiate a larger process of imagining and designing what consumers might truly value or desire beyond their immediate needs. For instance, and just to name one of infinite alternatives, one might envision a smart-fridge, which, every time it runs low on groceries, automatically orders electronically from the local supermarket and gets refilled from an externally accessible servicing door. To go shopping then assumes a completely different meaning, with an immense impact on the associated business opportunities.

Whether or not this alternative is desirable, the example aims to show that a strong emphasis on observation can be an impediment on two grounds: First, in today's common dissemination and application of design thinking, it is generally assumed that something radically new can be derived from observing the here and now. However, to focus on a given situation and to try to deduce or infer design solutions from what is being observed, necessarily frames the problem space; that is to say, by framing an existing context as a reference point for further development, the solution space for new alternatives is automatically limited (Cross, 2006; Kuhn, 1962; Simon, 1969). And second, what is more important, it prevents the designer from initiating a larger process of creating – of designing – what

people might truly desire or value and encourages a mode of thinking that proposes to match immediate need to demand. In short, it obscures the more fundamental question of "what desired future do we want to create?"

Many well-known business cases reveal the value of a design approach that "ignores" immediate circumstances in the here and now in favor of desired futures that designers seek to create. We find those approaches particularly in situations where products and services have reached their climax of performativity. For instance, one might think of Cirque de Soleil's response to increased popular opposition to the use of wild animals or BMW's *iDrive* automobile control unit, which quite quickly gained immense market acceptance despite its strange appearance and unseen mode of use. In none of these cases did an immediate circumstance or an urge to directly match a need to demand trigger the design process.

In architecture, efforts to capitalize on such a future-oriented design process are well known. Certainly, making use of this particular potential of design thinking goes back to the first creations of an ideal *civitas* or city-state, which in antiquity referred to both an urban and a socio-political organization (Eaton, 2001). Whether it is Thomas More's conception of an ideal state of a republic on the *New Island of Utopia* from 1516, Claude Nicolas Ledoux's 1804 urban and social design for a *Cité ideal*, Ebenezer Howard's late-nineteenth-century schemes for *Cities of To-morrow*, or more recent projections (and realizations) for ideal cities by Norman Foster, e.g., *Masdar City* –these are just a few examples of the many endeavors in which architects have tried or are trying to translate conjectures of an anticipated ideal state of urbanization into reality, rather than to observe, study, and embrace the here and now. Of course, it should be noted, not all such developments were desirable from the point of view of those concerned.

Furthermore, attaching great importance to observation blocks a design thinking approach that would embrace a larger process of imagining and creating what people truly desire. For good reasons, however, this later approach is generally ignored in managerial practice and scholarly research, despite its potential value for innovating business or society as a whole. Indeed, and as will be shown in detail, to study the actual circumstances that people (or customers) encounter and the possibility to build upon real and given situations, strongly supports the proof of newly conceived solutions. By contrast, to step outside the immediate problem space and to design what one truly desires – regardless of the immediate challenges at hand – certainly renders such proof difficult, due to the innumerably large range of possible hypothetical entities the design process rests upon. Legitimacy, in this case, cannot be acquired by truth or accuracy. Instead, it is about continued redrafting of an anticipated future so that it becomes more plausible, uses many different sources of corroboration, and thus becomes more resilient in the face of criticism. Such an approach in the face of an actual problem certainly brings about a different form of reasoning: Whereas in the former approach the design thinker searches for opportunities by observing and analyzing people's behavior in the here and now in order to hypothesize about potential design solutions, in the latter case the design thinker starts by hypothesizing about a desired future, to then hypothesize about its grounding in the here and now. Whereas in the former approach the newly designed alternative quite naturally meets people's demand in a given situational challenge, in the latter people would be challenged by the need to adapt to an unknown (but not necessarily undesirable) situation.

It is the aim of this article, therefore, to start with addressing in detail design thinking's potential to become more future-oriented and less of a process that embraces immediate challenges people face. In order to do so, I will contrast various forms of reasoning in the design process. The elaboration will also help to clarify the richness of

abductive reasoning in the context of the design process. I will then pinpoint the benefits of a future-oriented design process and outline particular limitations. Finally, I will direct attention to the larger implications for organizations in their effort to embed such a design process in a value-generating manner. Here I will particularly address the shortcomings of a two-step approach in design thinking, by separating the design process as such from communicating its results. I will conclude with recommendations for organizational embedding.

Forms of reasoning in designing alternative realities

I want to start with a definition of how design is understood in the following discussion. The understanding of design in general and its underlying process in particular varies significantly according to the disciplinary perspective taken. For the sake of parsimony, I therefore might propose to distinguish two basic and widely recognized perspectives: On the one hand, we might think of design as a material practice with a clear focus on making artifacts. Architects and designers exercise this activity every day. Christopher Alexander, one of the leading protagonists of a design science, convincingly argued that designing is a "process of inventing physical things, which display new physical order, organization, form, in response to function" (1964, p. I). Alexander's perspective certainly reflects the most commonly held view of design.

On the other hand, however, we might view design in its broadest sense as an activity aiming to transfer a given situation into a desired one, regardless of whether we think of making an artifact or strategically realigning a company. Proponents of the Information Processing Theory, notable Hayes (1978), Newell, Shaw, and Simon (1959, 1972), who called for cognitive-based explanations of creative thinking, showed that the intellectual activity taking place in the design of material artifacts does not fundamentally differ from that

involved in developing a new business model for a company or an economic incentive program for a nation (Simon, 1969). So construed, the process of design can be identified in many professions far removed from the "core" design disciplines, including business, education, law, and medicine among many others. I will build upon this latter view of design.

Following up on the view that design is not exclusively concerned with artificial objects, but also with all kinds of man-made phenomena (as opposed to natural phenomena), it is important to briefly explain my recurring phrase "desired futures" or its more abstract notation of "alternative realities." This allows me to show how a changing focus on a given or future situation induces varying forms of reasoning. The use of the adjective "alternative" in combination with the plural "realities" implies the existence of more than one reality; moreover, I seem to suggest that the design of alternative realities may lead to the application of different logics.

Let me take up these thoughts step by step. In his elaboration of the science of design, Herbert Simon showed that design "is concerned with how things ought to be," unlike science, which is all about "how things are" (1969, p. 144). Although this may seem to be an insignificant difference, its larger implications for the design process and the applied forms of reasoning are significant. First, an immediate implication is that by nature, design has an open-ended context within which a hypothetical alternative can be generated and tested. In other words, for designers who devise artifacts (or artificial phenomena) with the aim of transforming a given situation into a desired one, the generated alternative is dependent on how the situation is framed and how one thinks the situation "should" be changed. Certainly such a process is strongly guided by individual experience, creativity, and cultural background, among many other aspects of design behavior (Lawson, 1980; Rowe, 1991). Furthermore, situational problems that designers address are seldom simply structured,

but are "wicked" in the sense that they reveal complex interdependencies (Rittel & Webber, 1984). Efforts to solve such problems usually generate additional problems. Given these circumstances and coupled with the resource constraints designers face, it is not possible to find one and only one optimal solution that can satisfy all conditions and attain all goals (Simon, 1969); rather, design is necessarily about multiple possible alternatives that ought to be justified individually vis-à-vis a particular situation.

I shall now explain my use of the plural form of "realities" before turning to the core of my argument. I could, of course, shield myself behind the epistemological implications implied by the use of the plural form in the phrase "realities" (or "futures") and simply suggest that design transforms "the" reality. In fact, there is a deep hiatus between philosophical schools that address the intrinsic features of the world (or reality, or the universe) that exists independently of our representations of it, and those that address the social constructions of the world and therefore investigate the relationship between the mind and reality. However, for good reasons, I prefer to speak in the plural of realities.

Much of what we consider to be reality depends on our concept of objectivity and the contrast between the objective and the subjective. Searle (1995) convincingly showed that proportions of our real world, objective facts of the world, exist only by human agreement; that is to say, in contrast to brute and objective facts such as mountains or molecules, which exist independently of our representations of them, reality is also made up of objective facts that exist only because we believe them to exist. Things such as money, marriage, or government are objective or observer-independent facts in the sense that they are not a matter of personal preference. The piece of paper that represents a five dollar bill should be the equivalent of five dollars for all of us who are acquainted with the human institution of money (Searle, 1995). Hence, in contrast to brute facts, these "insti-

tutional" but objective facts depend on human agreement and acceptance of social constructions.

Given that design is not just a material practice but is generally concerned with the transformation of a current situation into a desired one, we may expect the design process to be capable of constructing institutional reality. Think of social innovations such as the Fair Trade System or the Emissions Trading System. These socially constructed (or designed) institutional realities barely manifest themselves as brute facts, but exist independently of our judgments or representations of them as objective facets of reality. However, in order to persist, these socially constructed facets of reality must be constantly reaffirmed by means of communication. This process introduces not just the opportunity for change, but also renders reality multi-faceted: on the one hand, because accepting and reaffirming socially constructed facets of reality necessarily leads to the dismissal of a hitherto maintained reality; and on the other, in this process language becomes the most constitutive feature through which humans create, accept, and reaffirm alternative realities (Searle, 1995). Without some form of language (which is shared within the boundaries of a system of social exchange) it is impossible to have institutional facts, because it is words or other symbols that are constitutive for the facts. Hence, the existence of an institutional reality is dependent to the extent its constitutive language is shared among individuals. To be more concrete, organizations have their own languages, which has an impact on sensemaking in given situations or adapting to conjectured situations (Dubberly, Esmonde, Geoghegan, & Pangaro, 2002; Pondy, 1978; Weick, 1995). It is in this sense that we might speak of realities rather than one and only one reality. Later I will return to the issue in more detail in order to illuminate obstacles that organizations face in embedding a future-oriented design thinking process.

Finally, I turn to the third and central issue of my proposition – namely that there are multiple forms of reasoning possible in design thinking and that one of these forms has been explicated in current managerial debate, but has not been consistently developed further. In his seminal work *The Science of the Artificial*, Herbert A. Simon (1969) extensively elaborates the logic of design, and asks whether there are differences in the form of applied reasoning there in comparison to the natural sciences. Of interest here are his insights drawn from the observation of designers when they are being careful about their reasoning. He concludes that the logic at work in design practice can be sketched as being merely an adaption method, in which, in iterative cycles, the designer aims to adapt the organized nature of a possible solution to the surroundings in which it is intended to operate. He concludes that it is not about finding (or computing) the optimal solution, which is by and large impossible due to the complexity or ill-structured nature of the problems and resource constraints, but rather about finding "satisfactory" solutions. In building upon the general information-process model of individuals' problem-solving behavior, the process of design is then conceived as an activity in which the designer searches selectively through an environment in order to acquire information needed to solve the problem presented by the environment (Newell & Simon, 1972; Simon, 1969).

Significantly, Simon (1969) failed to address the particular locus of sources of information that help to assemble sequences of actions that fuel a design process in generating a satisfying alternative; that is to say, he was clear about the role of memory as a repository of stored "information about states of the world" and how it might affect the interpretation and processing of newly gathered information (p. 121); however, he remained vague about the specific locus of the search activities. To put it in pragmatic terms, in aiming to transform a given situation into a desired situation, he did not specify whether

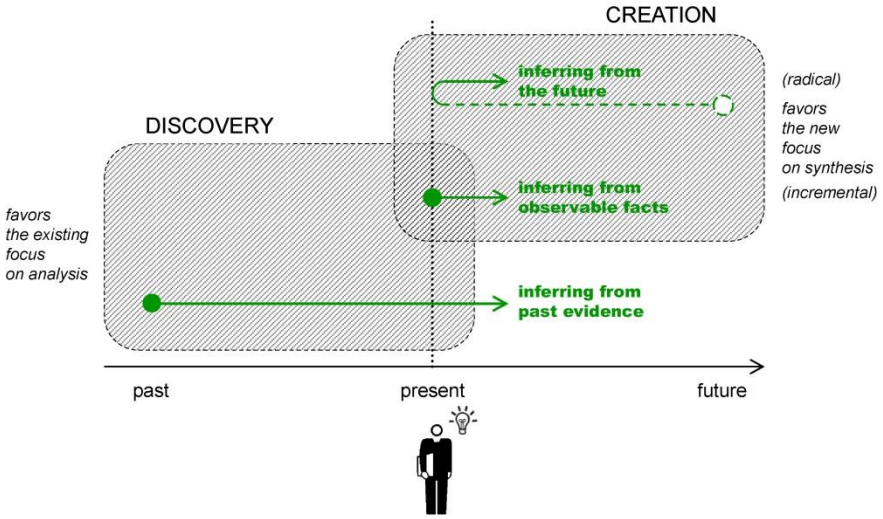

Figure 1 Loci of information fueling the design process

designers generate new alternatives on the premises of gathered information observed in the here and now, or, for instance, based on information underlying an anticipated future. Based on his approach from the perspective of human behavior in problem-solving, we might infer that the search environment he considered is congruent with the environment affected by the very problem in question.

It is interesting to observe that this important issue was not consistently developed further within the design discourse – regardless of the particular disciplinary context. The various propositions outlined in scholarly work suggest that there are multiple loci of sources of information possible: in the past, the present, and the future [see Figure 1 and Figure 2]. For instance, Akin (1986), who applied Simon's (1969) information-processing model to explore cognition in architectural design, almost takes for granted that designers rely on long-term memory; that is to say, in the first instance architects refer

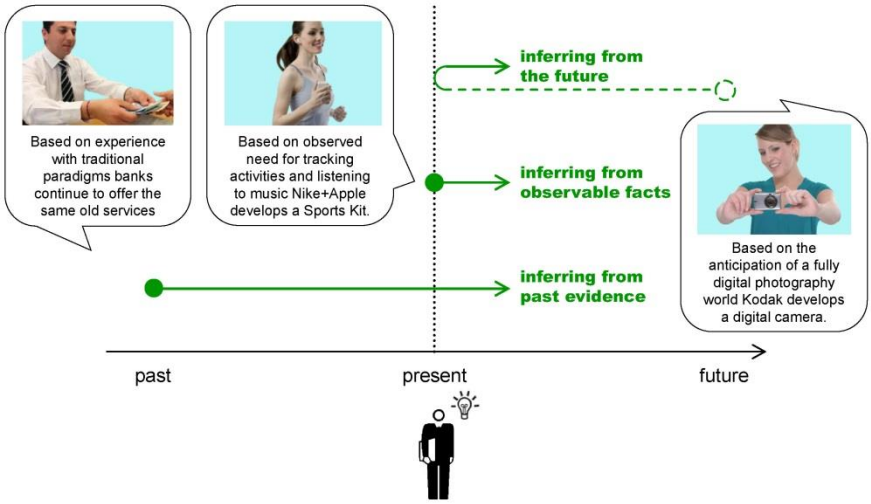

Figure 2 Varying forms of reasoning to infer solutions

to past solutions stored in their memory. Only when this is inadequate, he asserts, do architects "try books, drawings, on-site observations, interviews, documents and other survey methods to gather the relevant information" (Akin, 1986, p. 64). Schön (1983), who also looked at architectural design to derive his conclusions about how professionals think and reflect while in action, sees architects, designers, engineers, etc. as attending to the "peculiarities of the situation at hand" (p. 129). Thus, his observations clearly direct attention to the present as a source of information fueling the design process. And finally, Buckminster Fuller, one of the most prominent pioneers of a design science in the 1960s, argued in favor of an anticipated future as a key source of information. "You never change things by fighting the existing reality," he contended. "To change something, build a new model that makes the existing model obsolete." Hence, for Fuller neither the past nor the here and now provided a reference point for design actions. It is important to note that these three fundamental approaches correspond to practical realizations and can be

identified throughout the historical development of the environment we have constructed. However, for the sake of parsimony, I won't go into details here.

Significantly, approaches in the context of business reveal no substantial difference. Here too, perspectives on the loci of sources of information oscillate between the past and the future, although approaches with a future orientation have remained modest or marginal: Throughout the 1980s and 1990s, Tom Peters media effectively directed attention to management's obsession with "polishing yesterday's paradigms" and thus risked being a useful discipline (1997, p. 25). In his earlier book *In Search of Excellence* from 1984, he elaborates this point and there is no need to discuss this backwards-looking approach in more detail. Today, major management schools and leading corporate executives have come to the conclusion that no business success can been achieved without focusing on the customer in the here and now (see, e.g., Huff, Floyd, Sherman, & Terjesen, 2008, Chapter "Why is the Costumer Relationship Increasingly Critical?"). "All these bright people with Ph.D.s have to do," IDEO founder Tom Kelley wrote, "is to watch people" (2005, p. 16). "Figure out what people want and then give it to them" (Brown, 2009, p. 39). An emphasis on a truly distinct and desired future, however, is barely considered. Management scholar Russell Ackhoff, who was also educated in architecture, may be named as one of the few exceptions. Ackhoff (1981) sees in an ideal state of a particular circumstance the sources of information guiding the change (or design) process of organizations and society as a whole. The procedure for determining what actions are to be taken to change organizations from a current situation into a preferred one, he argues, "begins with the specification of ideals and works backward through objectives and goals" (p. 104). "This ensures," he states more precisely elsewhere, "that you do not erect imaginary obstacles before you even know what the ideal is" (Ackhoff, Magidson, & Addison, 2006, p. xxxiii). However, for probable rea-

sons discussed later, this approach has remained underdeveloped in current debates.

In the following, therefore, I will show how these theoretical propositions correspond with practical realizations. The main reason for citing the subsequent case studies is to show how a commonly accepted design thinking method may resort to different forms of reasoning and thus lead to various degrees of newness. Later I will address the relevance of this fine-grained view of design thinking. For the sake of parsimony, I will focus primarily on business cases, although there are plenty in the fields of architecture and design.

The past as a point of reference

The circumstances of the global financial crisis clearly showed that recourse to old rationales or past evidence created a massive mismatch between financial markets and the real economy for two reasons: Paradigms or shared beliefs that had been maintained for a long time suddenly ceased to become useful. The approach of proceeding from general principles or old premises to derive particular actions transforming a given situation in the here and now sooner or later had to lead to inadequate outcomes – simply because deductive reasoning, the logic at work in applying general principles, is not synthetic (or insight enlarging). It does not provide any new insights, because the information content of the conclusion must already be implicitly contained in the premises (Hurley, 2002; Peirce, 1965). Secondly, the chances are limited to developing suitable rationales to be applied to present circumstances by gathering and analyzing information from the past. This too leads to imposing solutions from the past or falling victim to the erroneous belief that the future continues to exist under the same paradigms that ruled the past.

Thus, a backwards-oriented search strategy for gathering information from the past generally tends to discover what has previously existed rather than to create “new” alternative realities. The applica-

tion of such information in a design process is certainly possible, but it raises a question concerning the validity of such actions. One might think of current models of a sharing economy that partly take up the old barter systems of exchange (Weitzman, 1984). In the field of architecture, one might refer to Prince Charles' advocated county town "Poundbury," which was designed according to medieval urban design principles.

The present as a point of reference

Nike's and Apple's collaborative design of a "Nike+iPod" *Sports Kit* suggests a close observation of their customers in the here and now. In 2006 the two companies jointly developed a device that tracked the distance and pace of runners. The lightweight tracking module, which included a transmitter, was to be placed in a recess of the inner sole of a Nike shoe. The transmitter communicated with either a receiver connected to an Apple iPod or a Nike+ *Sportsband*. The use with an iPod allowed viewing and sharing tracked activities with friends via social networks [see Figure 3].

By introducing this sports equipment, both companies successfully converted a need into demand: "Runners always want to know how far they have gone, how fast they are going, and how many calories they are burning" (Michael Tchao, General Manager Nike Techlab/Nike+, video interview in Meur, 2008). By offering a technology to amass data and to share it, Nike managed to build the world's largest community of runners; in less than five years, between 2009 and 2014, Nike's community grew from 1.2 million to 18 million members tracking their exercise (McClusky, 2009; Nike, 2013). "40% of community members who didn't own Nike+ ended up buying" (Roberto Tagliabue, Director of Digital Innovation at Nike and project leader of the Nike+Apple Project, cited in Lawrence, 2008).

In an interview, Roberto Tagliabue (cited in Lawrence, 2008), vividly explains the approach in developing the tracking device:

We noticed that something interesting was happening in the world of running: more and more people were running with music and a good majority were running with an iPod. We thought that we could add a little extra that could enrich the experience of running. So we made a sensor that tucks into the shoe. We worked with Apple to have the sensor talk to your iPod and reveal your running data while you are listening to music. The big learning? Enrich an existing behavior and make it simpler: press a button and start running. We will do the rest. Do not disrupt something very basic and liberating like going for a run with tons of complex features.

Nike's approach to identifying consumer needs by observing their behavior clearly suggests the use of induction as a primary form of reasoning, because it aimed to examine specific information, perhaps many pieces of specific information, to derive a general principle. Unlike deductive reasoning, which applies general principles to reach specific conclusions, inductive reasoning, where the conclusion is likely to follow from the given evidence, provides the ability to learn new things that are not obvious from the evidence (Hurley, 2002; Peirce, 1965). At Nike the "big learning" was that there is a need to enrich, but equally to simplify existing running behavior.

What is of interest here is that the stimuli that triggered Nike's design process arose exogenously from a specific circumstance or market imperfection – in our case, from certain consumer behavior. Based on the particular needs that Nike identified in observing runners, the designers generated several hypothetical solutions for the problem at hand. The emphasis on exogenous stimuli forming the premises for a design process has several important implications. It suggests that the design process is based on realistic assumptions. In their case, the basis for the design process exists as a real and objective phenomenon, independent of the actions or perceptions of the designer. This is a decisive criterion for legitimizing additional

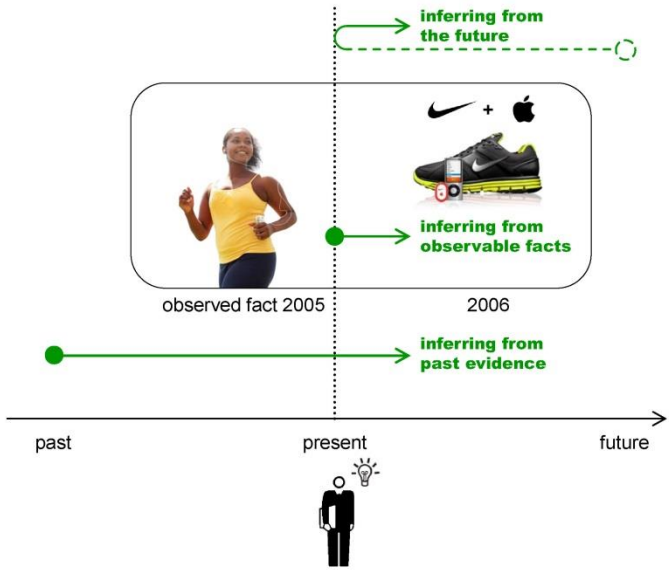

Figure 3 Reasoning applied in designing Nike+Apple *Sports Kit*

design actions. Consider designers concerned with the truth of a hypothesis that predicts an alternative reality. An immediate implication of being confronted with a given situation is that the boundaries of the context within which to test the hypothesis are already set. This entices one to direct attention and to respond to things and relations discovered in the given problem space.

Committed to an exogenous circumstance, design ultimately becomes a "reflective conversation with the situation" in which the designer "shapes the situation, in accordance with his [or her] initial appreciation of it, the situation 'talks back,' and he [or she] responds to the situation's back-talk" (Schön, 1983, p. 79). Such a design approach entails a problematic limitation. It assumes that the analysis of a prevailing condition equally entails the perfect solution. Moreover, it presupposes that a prevailing condition can be transformed into a perfect one. Remember the shopping cart example I referred to

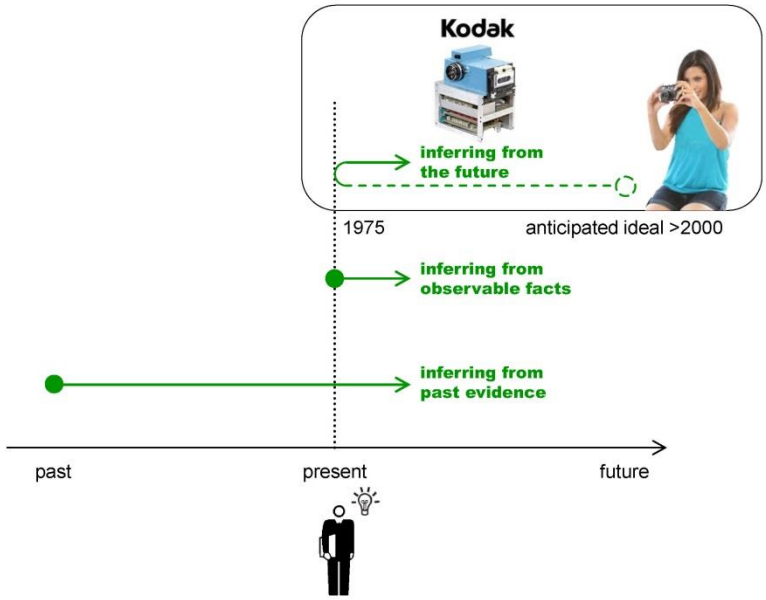

Figure 4 Reasoning applied in designing the first digital camera

in the introduction. The focus on an enhanced shopping experience in the supermarket guided designers to come up with a better shopping cart; they did not call into question the very existence of the supermarket as such.

Hence, design thinking as a response to exogenous stimuli can become an impediment. Rather than initiating a larger process of creating – designing – what one truly values or what might be ideal for a given situation, it suggests a way of thinking that proposes to fix something that is broken. Framing a given situation does not necessarily mean that it is impossible to reframe it, as many scholars concerned with problems-solving behavior or design have suggested (Lloyd & Scott, 1995; Valkenburg & Dorst, 1998); however, due to constraints such as available resources, clients, or targeted customers, reframing takes place within the boundaries of a given problem space. Besides, to identify self-imposed constraints is usually diffi-

cult, because we are generally unaware of them. It takes great effort to reset the boundaries of once-framed problems (Ackoff, 1981; De Bono, 1970). The well-known nine-dot problem is a case in point.

The future as a point of reference

In 1975, when the world's first digital camera was invented, there was no demand for such a device nor could anybody have made serious use of it. At that time, film-based point-and-shoot cameras became extremely popular. The idea of a personal computer, which today finds its way into every household, allowing people to post photos on the web, was still dismissed in the computer industry as being totally absurd. Neither were there any electronic devices to print or store photos. In short, in the mid-1970s there was neither demand nor an ecosystem for cameras that could have captured images electronically. Steve Sasson (cited in Shamiyeh, 2014, p.114), who as a young engineer at Kodak invented the digital camera, described the events around its development as follows:

I have to explain to you that no one asked me to build a camera. It was a filler project to look at this type of device [called a Charge Coupled Device, which could convert patterns of light into a pattern of electrons], *but I simply thought that a good way to see how the device would perform would be by capturing an image, and then if we wanted to capture an image, wouldn't it be nice to put it in something portable that would capture images and store images? So it was really a desire on my part to just try to build this.*

Less than a year later, Sasson was able to present the world's first digital camera, which looked more like a toaster than a camera and weighed about 8-1/2 pounds [see Figure 4]. He did so without being guided by any consumer needs or prevailing technologies. "Nobody knew how to do this stuff and at the time he had to come up with solutions to all of his problems really almost single-handedly" (Brad Paxton, back then director of Electronic Imaging Research Laboratories at Kodak and Steve's supervisor cited in Shamiyeh,

2014). The camera was created endogenously, by the actions and reactions of Steve Sasson, exploring ways to produce a new imaging device. In contrast to the design of the "Nike+iPod" *Sports Kit*, which evolved out of search activities to discover valuable sources of information in the existing world of runners, for Sasson the term "search" had little or no meaning – precisely because it implies an attempt to discover facts, like the behavior of runners, that already exist. In Sasson's design process, the context for his prediction of a desired future was purely hypothetical and thus non-existent. In other words, whereas Nike and Apple could ground their hypothetical new reality – a runner with a sensor in his or her shoe that talks to the iPod and reveals running data while the runner listens to music – upon information evident in the real world, in the case of Sasson, both the design context and the prediction of an alternative reality were hypothetical. As mentioned above, in the early 1970s there existed neither consumer demand nor technologies that could have rendered the capture of digital images feasible. This aspect seems to be insignificant; however, its implications for the design process, the newness of outcomes, and its legitimacy are significant. To address these issues, it is necessary to look more closely at the different forms of reasoning applied in both cases:

As discussed above, Nike and Apple examined specific information gathered from the real world in order to discover and assemble solutions transforming the given situation of runners to a preferred one – one in which technology assists runners. The form of reasoning applied to frame the design context was essentially inductive. The creation of the alternative reality, to add a little extra that could enrich the experience of running, however, was abductive.

Abduction "merely suggests that something may be," as opposed to deduction, which "proves that something must be," or induction, which "shows that something actually is operative" (Peirce, 1965, CP 5.171). More commonly, abduction is understood as inferring

backwards from a set of data to a hypothetical situation that would best explain the data (Harman, 1965; Walton, 2004). It is a process "where we find some very curious circumstance, which would be explained by the supposition that it was the case of a certain general rule, and thereupon adopt that supposition" (Peirce, 1965, CP 2.624). The creative assertion or invention of a cause, also known as a "What-if and Then" statement, therefore, becomes preliminary to abductive reasoning (Nagl, 1992). It is for this reason that Peirce (1965) argued that abduction is the only logical process that fosters initiative and thereby actually creates anything new.

Johannes Kepler's reasoning, in drawing his conclusions about the observed configuration of the planets so as to exemplify their interplay, can be taken as an instance of abduction (Peirce, 1965): After years of inquiry into the planetary configuration and dissatisfaction with the geocentric view of the world, Kepler went off to develop his own model for calculating planetary positions. At that time the Copernican or heliocentric view was merely a hypothetical model without proof. Moreover, there was no rigorous idea about the exact form of the planetary orbits. It was Kepler who hypothesized that Mars may orbit the sun in the form of an ellipse, which introduced a radical new paradigm about our world for several reasons. On the one hand, it questioned the prevailing worldview in which the Earth was considered to be at the center of the universe. On the other, it suggested that the forms of planetary orbits are not circular but elliptical. Kepler's abductive reasoning was grounded in a rich set of data about the movement of Mars, which he had long tried in vain to fit within the possible limits of error of the observations. At first, his idea about planets moving in elliptical orbits around the sun was merely a suggestion. For this reason Kepler proceeded to test the hypothesis deductively, meaning he undertook the calculations of the latitudes from his elliptical theory without knowing whether the calculations would agree with the observations. In a final phase, he inductively verified his proposition.

In this regard, we might assert that the form of reasoning applied in generating an alternative reality in the cases of Nike/Apple and Kodak is of no different than the one used by Kepler; that is to say, the hypothetical proposition of a world in which runners are assisted by a new tracking technology or photographers are equipped with a new image-capturing technology is based on abduction, like Kepler's hypothesis on the planetary orbits.

However, the examples reveal differences in grounding the actual design process. Whereas Kepler and Nike/Apple could rely on inductive reasoning to gather data in the real world to guide the design process and supply strong evidence for the appropriateness of their design, in the case of Kodak, the context to ground a digital camera was purely conjectural or abductive. The context that Steve Sasson envisioned – a world in which the entire imaging process is digital, including capturing, storing, editing, processing, and sharing – was purely hypothetical and thus opened the door to the possibility of all kinds of future contexts yet to be determined. Hence, in this future-oriented design process, the act of framing the situation one intends to respond to and the act of designing the situation as such become a dialectic endeavor, forcing the designer not only to conceive of a possible situation, but also to think about how to contribute to or transform this situation.

Building upon this difference, we might distinguish between a design (thinking) process that rests on discovery of what already exists and one that rests on creation. The emphasis on discovery suggests that the design of an alternative reality is first and foremost about how searching exogenous stimuli provides design opportunities – systematically scanning the environment to discover opportunities to create new products or services. On the contrary, an emphasis on creation suggests that design opportunities are not assumed to be objective phenomena formed by exogenous stimuli; rather they are to be created, endogenously, by the actions of the designer, exploring

ways to produce new products or services. In this sense, opportunities embraced in creation-driven designs are social constructions that do not exist independently of the designer's imagination (Aldrich & Kenworthy, 1999; Berger & Luckmann, 1966). It is important to note that this form of analysis is not unique to the design disciplines, but finds its equivalent in the literature on entrepreneurship, with its focus on opportunity discovery and opportunity creation (Aldrich & Kenworthy, 1999; Aldrich & Ruef, 1999; Alvarez & Barney, 2007; Gaglio & Katz, 2001; Gartner, 1985; Shane, 2003; Venkataraman, 2003)

The importance of a future-oriented design process

What could be the purpose of engaging in a future-oriented design (thinking) process? Why should one take the risk to create alternative realities that do not evolve out of existing situations? Why engage in a design process whose outcome cannot be understood until its hypothetical context exists? Think of Steve Sasson, who at Kodak designed a camera that was useless in the analog world of chemical-based photography back in the 1970s.

The work of Giovanni Dosi (1982), a renowned expert in the economics of innovation and technological change, is illustrative for answering these questions. By referring to the seminal work of Thomas Kuhn (1962), he proposed a perspective of technological change resting on the concepts of "paradigm" and "trajectory." "Technology," for Dosi (1982), is "a set of pieces of knowledge, both directly 'practical' (related to concrete problems and devices) and 'theoretical' (but practical, applicable although not necessarily already applied), know-how, methods, procedures, experience of successes and failures and also, of course, physical devices and equipment" (p. 151f.). The achievements of technology, according to this view, are "embodied," so to speak, in two parts: On the one hand, technology exists in a particular product or process, and on the other, it exists in

a “disembodied” part that relates to the particular skills, experiences, and knowledge used in previous technological solutions. In this sense, technology is very much about design.

The point that is of interest here is Dosi’s view about the limits of performativity of technology. He could show that every technological change follows a “trajectory,” that is, a pattern of actions related to searching for and solving problems based on a particular logic or “paradigm” that is immanent to the very technology itself. This “technological paradigm” defines the relevant problems, the patterns of inquiry, and, consequently, the pattern of solutions for the selected problems. Thus, technological paradigms embody strong determinations in regard to the directions in which technology can change. Or, to formulate it differently, every technology has boundaries to possible technological variations and paths of progress. At a certain stage, the technological process becomes either too complex or the effort required too large. The only feasible way then to push the limits of performance is to redefine the technological paradigm altogether (Sahal, 1981). The challenge to the design of wind-powered vessels from new technologies is a compelling case (Foster, 1986). To compete against the new steam-powered vessels that had increasingly taken the cargo business away from sailing ships, designers had to improve traveling speed. But to gain swiftness, designers had to sacrifice maneuverability. As a consequence, ships became difficult to handle and unstable. Several reports of capsized ships finally brought about the end of commercial sailing, and steamships began to rule the seas. Attempts to design faster cargo-carrying sailing ships ended.

The case demonstrates that technology improvement or evolution along a given trajectory led to incremental changes – faster sailing ships – and also that the paradigm underlying the technology sets limits to its improvement. To overcome the given limits, it was important to introduce a radical technological change by defining a

new paradigm – steam technology. Thus, the case clearly reveals the need for different approaches in design. For centuries it was adequate to design better sailing ships by embracing the immediate challenge of "sailing"; that is to say, to focus on the given situation and to improve it. However, and as the case clearly shows, there are times when a technology reaches its limits in terms of performativity and can't be improved any further in an evolutionary manner. The Nike/Apple case versus the Kodak case exemplifies the two poles: evolution by embracing the present or revolution by anticipating the future.

Today we may find many examples that may reveal the need for an approach that makes design more future-oriented and less of a process embracing the old paradigm. Elsewhere I have discussed the renewal of the business model of the traditional circus, which has been in crisis since the turn of the century (Shamiyeh, 2007a). I showed that the "design" of the Cirque du Soleil, one of Canada's largest cultural exports, reveals strikingly the operative limits of design by evolution. But we may also broaden the scope and look at the future of the global economy:

Today there is a clear perception that the global economy can't continue as it is, given the planet's resources, its natural systems, and the population that is living in poverty (Meadows, Randers, & Meadows, 2004; Meadows, Meadows, Randers, & Behrens, 1972). It has been extensively shown in research and best practices that the answer to the problem rests in a radical shift from the linear cradle-to-waste industrial-age systems to a circling cradle-to-cradle system following the logic of nature – the so-called "triple bottom line" (Ayres, 2004; Ayres & Simonis, 1994; Braungart, McDonough, & Bollinger, 2007; McDonough & Braungart, 2002, 2010); that is to say, the global economy would need to change from continuing to improve its prevailing linear system in an evolutionary manner, to anticipating a future in which products and industrial systems are

developed that maintain or enhance the quality and productivity of materials through subsequent life cycles. Strategies towards pollution prevention or energy efficiency certainly reduce the ecological impact (and are thus worthwhile), but given the point of damage to the earth's eco-system today, there is no point in being less bad.

Embedding a future-oriented design process

Design actions, or, to formulate it in business terms, entrepreneurial actions, that aim to transfer a given situation into a preferred one, generally take place within a system of social exchange, regardless of the scope of change. In the context of business, we may equate systems of social exchange with an organizational setting. For instance, there won't be a new shopping cart without someone who designs it and others who produce and commercialize it; but there also won't be a new shopping cart without a supermarket offering it for an enhanced shopping experience and consumers who are willing to use it. Consequently, ambitions to introduce an alternative reality are necessarily bound to an organizational setting that provides support for the development and exploitation of the design (or business) opportunity. Without such a setting, propositions about alternative realities remain stuck at the level of the individual. For designs, which in the first instance are merely representations about a hypothetical alternative reality (Evans, 1997), to become an organizational initiative in order to be realized, they have to move from a state of subjective reality that is only valid for the individual to one of objective reality that a group or organization agrees on (Floyd & Wooldridge, 1999; Nonaka, 1994; Nonaka & Takeuchi, 1995).

But what is more important for organizations, alternative realities have to make sense in order to for actions to be taken (Weick, Sutcliffe, & Obstfeld, 2005). Regardless of how small or large the change introduced by a new alternative reality will be, for better or worse, individuals within and outside the immediate organizational

setting will be asked to comprehend the new stimuli and to make sense of them in order to determine future behavior. This holds true particularly in organizations as a specific form of systems of social exchange, because they are "goal directed, boundary-maintaining, and socially constructed systems of human activity" (Aldrich & Ruef, 1999). Unlike other groupings of humans (such as a family), social interactions in organizations are defined on the premises of particular roles people play, roles that entail certain expectations because they are associated with particular functions. As a consequence, members of an organization will "attempt to order the intrinsic flux of human action, to channel it toward certain ends, [and] to give it a particular shape, through generalizing and institutionalizing particular meanings and rules" (Tsoukas & Chia, 2002, p. 570). It is particularly this transient nature of sensemaking that is central for informing and constraining future human behavior (Weick, 1995). The events related to the presentation of a filmless camera at Kodak, which was then the world's largest film company, are illustrative for sensemaking in the context of alternative realities (Steve Sasson cited inShamiyeh, 2014, p. 240f.):

Shortly after Steve Sasson finished his prototype of a digital camera, he went to his supervisor, Gareth Lloyd, and told him that the camera was working and he had managed to take a picture. Lloyd immediately suggested bringing some people into the lab to present the camera. Because no one has been paying attention to his work, Sasson remembers, there was not even any awareness that the camera was a portable device. It could easily be taken to any conference room at Kodak or outside. Recalling the particular circumstances related to championing a filmless camera, he explained that he never finished a presentation because conversations started and people began to ask all kinds of "galactic" questions: "Why do you think this is going to work?" "Why do you think anybody would want to look at their picture on a television set?" "You've got all these things on magnetic tapes, how are you going to store all this stuff?" "What's

this electronic photo album going to look like?" Or "Nobody would ever want to do that, they love prints – that's ridiculous." After having presented the camera several times, Kodak's management decided to stop further development and to keep it under wraps (until the new millennium).

The challenge in designing and integrating an alternative reality is therefore to establish mechanisms by which the probability of an interaction between a difference that introduces alternative reality and existing routines is increased. Only when the alternative has proven itself in the practice of organizing, when it becomes meaningful for the organization, can it come into existence and reach its full potential as generating an added value. Indeed, such a process depends not only on the skills and abilities of the individuals in making sense of new alternatives, but also on the quality of social exchange within the organizational setting itself (Dess et al., 2003; Floyd & Lane, 2000):

Weick (1995) showed that sensemaking is central because it serves as a springboard to action. When members of an organization are confronted with something unintelligible, they ask, "What's the story here?" Their question has the power of bringing a new stimuli into existence; and when they then continue to ask, "Now what should I do?" their questioning has the potential of bringing meaning to the event that they "hope is stable enough for them to act into the future" (Weick et al., 2005, p. 410). Sensemaking is therefore the circumstance whereby meanings emerge that constrain prevailing identities and inform future behavior (Mills, 2003). It is an issue of language as well as communication, because a new alternative is talked into existence. And, importantly, organizations have their own languages and symbols that have important effects on sensemaking. As Pondy (1978) argued, vivid words draw attention to new possibilities, suggesting that organizations with access to more var-

ied images will engage in sensemaking that is more adaptive than will organizations with more limited vocabularies.

While these descriptions may help to delimit sensemaking, they say little about the quality of social exchange within the organizational setting. The answer is that different approaches in design – discovery-driven design versus creation-driven design – constitute different forms of organizational embedding of the design process to promote sensemaking. This will be addressed in detail in the following.

Sensemaking in discovery-driven design

The idea that design aims to change a given situation into a preferred one gives primacy to the search for meaning in the difference between the two. Thus, members of an organization engage in sensemaking whenever a proposed conjecture about an alternative reality is perceived to introduce a "difference" from the current state of reality. This means that sensemaking starts when a situation is experienced or perceived as introducing a difference. Experiencing or perceiving this difference certainly disrupts expectations about routine or maintained continuity (otherwise there would be no difference). Such a situation may be experienced as a circumstance of discrepancy, surprise, opportunity, or interruption (Weick et al., 2005). And regardless of how diverse the interpretations of the situation may be, people will try to make sense of it by trying to construct plausible explanations for what is being perceived or experienced in order to normalize the disruption, restore prevailing expectations, and ensure continuity. As Weick et al. (2005) put it, "[only] plausible stories keep things moving" (p. 415).

Significantly, sensemaking is not about truth; it is about an ongoing process of trying to comprehend a situation (or a conjecture about a future situation) so that it becomes plausible. Mills (2003) found that the plausibility judgment of situations may vary depending on group association. For instance, what managers might perceive as plausible

might prove implausible for employees. Furthermore, Mills (2003) showed that a situation is usually rendered as plausible when it "taps into an ongoing sense" (e.g., low morale); "is consistent" (e.g., employee surveys); "facilitates, rather than disrupts, ongoing projects"; "reduces equivocality" (e.g., the reduction of problems); "references a sense of 'accuracy' "; and "offers a potentially exciting way forward" (p. 169). Weick (1989) is more precise in regard to the plausibility of conjectured situations, arguing that they are judged as plausible first and foremost when their statements are "believable" (that is what every reader's experience will corroborate), "real" (which invokes some combination of experience, practice, and convention, as opposed to ungrounded conjecture), and "obvious" or "beautiful" (which indicates that statements must be easily comprehensible and appealing for the reader). In the field of cognitive sciences, Connell and Keane (2006) found that a presented situation (whether real or conjectured) is viewed as plausible when it fits with prior knowledge (e.g., using many different sources of corroboration), minimizes the use of complex explanation (e.g., does not rely on extended or convoluted justifications), and uses minimal conjecture (e.g., avoids the introduction of hypothetical entities). Diverse as these findings may seem, they share the properties that in every case of discovery-driven design it is deemed that a situation that ought to be considered as plausible should rely on prior knowledge and avoid the introduction of hypothetical entities. Design approaches vary significantly in this regard.

In discovery-driven design – a design process that embraces an existing circumstance that people encounter [seeFigure 5] – members of an organization can make plausibility judgments about a conjectured future on the grounds of its verifiability or refutability by observation in the real world. Procedures applied in reaching conclusions "utilize evidence that can be ascertained intersubjectively" (Feigl, 1964; cited in Floyd & Wooldrige, 1999, p. 128). It is in this respect that a variety of analytical techniques can be applied to esti-

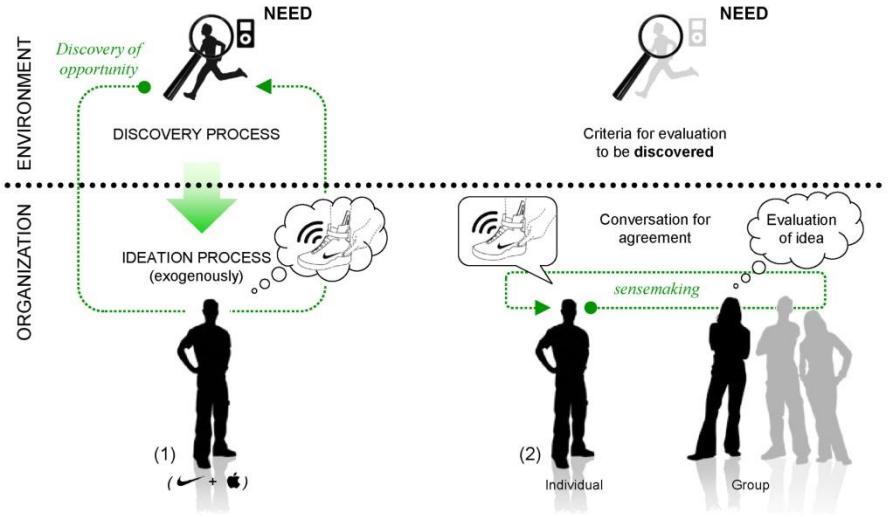

Figure 5 Assessing truth in discovery-driven design

mate the opportunities and risks associated with the particular design. For instance, Nike and Apple could have surveyed the market (and probably did so) of runners using Nike equipment while listening to iPods or estimated the number of runners wanting to get data about their performance. Moreover, in discovery-driven design it is possible to logically infer possible outcomes. Both the trajectory and duration of the search and development process to discover and exploit opportunities to produce new products or services can be deduced and are guarded just against either a more local search – where modest opportunities for discovery exist – or more global search (Gharajedaghi, 1999; Levinthal, 1997; Rasiel, 1998; Rasiel & Friga, 2001). The decision of whether an organizational initiative is to be pursued can be evaluated against likely outcomes, required resources, and most importantly, current organizational goals. It is in this sense that the current view of a two-step approach for designing the alternative reality and a subsequent phase concerned with

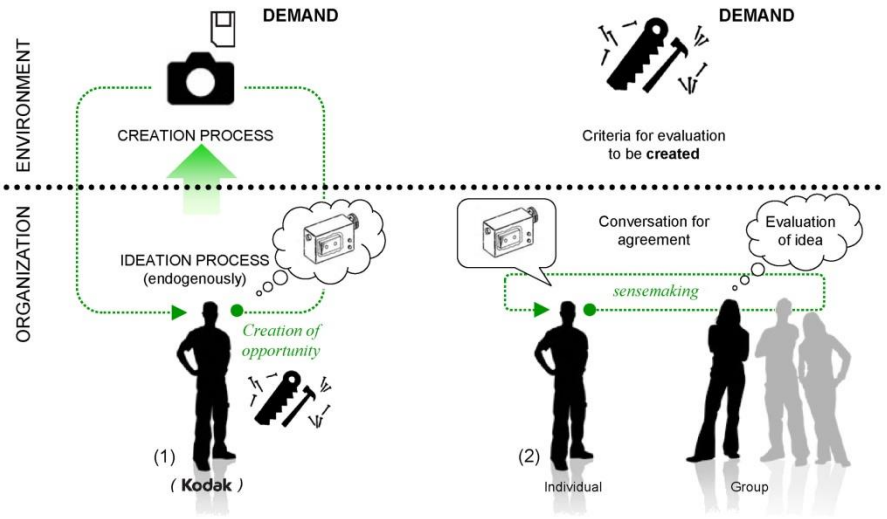

Figure 6 Assessing plausibility in creation-driven design

implementing the design appears possible. In creation-driven design, the premises are completely different.

Sensemaking in creation-driven design

In creation-driven design – a design process that embraces a hypothetical desired future, regardless of the circumstances people encounter at present [seeFigure 6] – validation and risked-based decision making becomes impossible because the design is not grounded yet in the real world. In creation-driven design, conjectures about a future situation do not necessarily evolve out of existing situations. As noted earlier, the term discovery or search has little meaning in this approach, because the designer is not looking for opportunities to ground his or her design upon, but rather to create those very conditions. Endogenously created designs are social constructions (Berger, 1967; Berger & Luckmann, 1966; Searle, 1995). They do not exist independently of the designer's perception. The alternative

reality – the desired future that one aims to bring into existence and to exploit – can only be understood after the creation process has unfolded completely. Only starting points and initial directions for actions can be known. These initial actions are determined either more intelligently or blindly (Campbell, 1960). However, in creation-driven design, it will rarely be possible to perceive the final outcome, the conjectured future to be exploited, in its full scope from the beginning (Berger & Luckmann, 1966; Weick, 1969). In other words, the desired future and the applicability of endogenously created designs grounded in this reality cannot be tested until the formation process has come to an end. Intended outcomes – the actual crystallization of an idea into the form of a real artifact or service (Nonaka, 1994) – must come into being, and they only come into being after they have been crafted in an iterative action-reaction process (Berger & Luckmann, 1966; Weick, 1969).

Thus, while in discovery-driven design, analytical methods can be used to generate and test hypothetical alternative situations against a given (and real) situation, in creation-driven design, the alternative situation (e.g., photographers with digital cameras) and the context to ground upon (e.g., full digital eco-system) remain hypothetical unless both are brought into being. Given the premise that sense-making (and thus future behavior) relies on plausibility, this circumstance renders validations and acceptance of the creation-driven design approach in organizational settings difficult. To repeat, plausible situations rely on multiple sources of corroboration that affirm the potential of being real and avoid the introduction of hypothetical entities.

It is in this sense that any creation-driven design approach is destined to fail when pursued in the widely acknowledged two-step design approach of making a design and subsequently "carrying" it into the organization for the purpose of implementation. As a social construction that does not exist independently of the actor's percep-

tions, creation-driven designs require an evolving and commonly shared consciousness; that is to say, members of a system of social exchange can only make sense of the conjectured reality when actively and continuously involved in its construction. As Berger and Luckmann (1966, p. 172-173) noted:

the most important vehicle for reality-maintenance is conversation. … At the same time that the conversational apparatus ongoingly maintains reality, it ongoingly modifies it.… Thus the fundamental reality-maintaining fact is the continuous use of the same language to objectify unfolding biographical experiences. In the widest sense, all who employ this same language are reality-maintaining others.

The language shared in the organization is thus the enfolding of symbols and meanings that define the environment in which consciousness about a shared and anticipated future evolves. It provides the premises for those seeking to reach agreement in an organization and therefore the medium to generate thought and action (Dubberly et al., 2002). Only through discursive interactions in which the implicit nature of meaning is made explicit, is an opportunity created for those involved in the conversation to generate a common meaning through sharing and to refine a shared language (Jenlink & Banathy, 2007).

Thus, I may conclude, given that creation-driven design is important, that there is a need for appropriate forms by which to embed such a design process in organizations. Rather than maintaining a two-step process of design and subsequent implementation, there is a need for leadership modelling of the design process as an ongoing process of "design conversation." Design conversation has been defined variously (Banathy, 1996, 2000; Dubberly & Pangaro, 2009; Jenlink & Carr, 1996). Here, by design conversation I mean conversations that "serve as the medium for the reciprocal process that enables [participants] to construct meanings towards a common purpose" (Lambert, 1995, p. 83). Understood in this way, conversation,

as a medium, contributes to building language that allows members of a system of social exchange to gain access to more varied images and to make sense of collectively created constructions of reality (Pondy, 1978; Weick, 1995). It provides a "forum for exploring individual and collective concerns, examining common experiences, developing shared meaning, identifying core ideals, values, beliefs – what is sacred, constructing a change community language, and creating 'community of mind' essential to a design community" (Jenlink, 2007, p. 7) Designing a desired future is then guided by the conscious awareness of what is desired and by actions essential to realizing that future.

Certainly such a process can't take place outside the boundaries of organizations and also not in a clearly discernible design phase, which renders inadequate the current aspirations of design practices that seek to help organizations in their quest to design alternative realities from outside. Formulated in a different language and encompassing aspirations foreign to the organization, design and context to ground upon would meet lack of understanding. Nevertheless, design conversation may be thought of as a co-evolutionary process in which new meanings are collectively created through changing relationships, e.g., by responding to stimuli from outside, rather than by overtly confronting an organization's power structure.

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