Escaping the 'Faster Horses' Trap: Bridging Strategic Foresight and Design-Based Innovation

Adam Gordon, Rene Rohrbeck, and Jan Schwarz

> *"If I had asked **them** what they wanted, they would have said faster horses!"*
>
> Attributed to Henry Ford

Design thinking is inherently and invariably oriented towards the future in that all design is for products, services or events that will exist in the future, and be used by people in the future. This creates an overlap between the domains of design thinking and strategic foresight. A small but significant literature has grown up in the strategic foresight field as to how design thinking may be used to improve its processes. This paper considers the other side of the relationship: how methods from the strategic foresight field may advance design thinking, improving insight into the needs and preferences of users of tomorrow, including how contextual change may suddenly and fundamentally reshape these. A side-by-side comparison of representative models from each field is presented, and it is shown how these may be assembled together to create foresight-informed design-based innovation.

Introduction

Design thinking is an innovation approach based on the processes by which creative designers think and work (Brown, 2008; Rowe, 1987). Presenting a codified framework and repeatable methodology for innovation, at a time when innovation is highly prized in business activity and competitive strategy, design thinking has gained rapid adoption, particularly in innovation practice over the last decade. As design thinking has taken hold, the process has been expanded from innovating products and services to improving management thinking and decision-making processes, "bringing designers' principles, approaches, methods, and tools to problem solving" (Brown, 2009).

Strategic foresight as a field strives for non-predictive understanding of plausible future states that may come to be in a market, sector or industry, in order to improve present strategic decisions. As design thinking has emerged, it has stimulated thinking in the foresight field as to whether, and if so, how design thinking may be used to improve strategic foresight (Kelliher & Byrne, 2015). Chermack and Coons (2015) refer to a "fertile soil" in the integration of design thinking and strategic foresight. The overlap between these fields was the subject of a special issue of the journal *Futures* (Vol. 74; 2015), with particular attention to connections between design thinking and scenario planning. It has also been a theme of a recent Design Management Academy conference, Hong Kong, 2017 (Buhring, et al., 2017).

Such publications and activities deal with why and how design thinking improves strategic foresight. The equivalent, opposite benefit has not been considered, which is our purpose here. We address the benefits of strategic foresight-informed design thinking, identifying some of the enhancements it offers to standard design thinking, particularly in facing vulnerability to sudden industry change. This is the "why" question we pose and answer. Further, we consider the "how question": how strategic foresight may be incorporated into design thinking, in a way that maintains the integrity of the design thinking method. In a side-by-side comparison of representative models from each field, we show how its benefits can be adopted and integrated. Our goal is not to amalgamate design thinking and strategic foresight. These are different methodologies, set up to

resolve different types of problems and achieve different goals, and should remain so. Our purpose is to show how and why strategic foresight is important to design thinking and how its benefits can judiciously be inserted into the design thinking methodology.

In either version of the design thinking strategic-foresight association, the key nexus point in their overlap is the self-evident axiom that every product of design thinking will, by definition, be used in the future (Evans, 2014; Selin et al., 2015). In this, design thinking processes can sharpen future-expectations, particularly in anticipating consumer reaction to new technologies and products; equally it suggests that a design thinking innovation format that consciously and robustly account for future changes within its process, will be more successful than design thinking that does not.

In building an understanding of the role of foresight in design thinking, we refer to commonly accepted practice models of design thinking. In particular, these are the Stanford D-School's (the Hasso Plattner Institute of Design) 5-step process (dchool.stanford.edu); the European Hasso-Plattner-Institut's 6-step process (hpi-academy.de); the British Design Council's 'Double Diamond' (designcouncil.org.uk); and the 3i's model based on Inspiration, Ideation, Implementation associated with Ideo (Brown, 2008). Across these various sources, it is apparent that none of these accepted design thinking models includes a "step" that directly addresses foresight, or attempts to create a point of view of contextual future-oriented change. Studying the activities that characterize the steps of design thinking as cited above, including the early phases commonly referred to as "discovery" or "inspiration," or user "observation" and "empathy," leads us to conclude that foresight is at best only very tangentially considered in the process, if at all. User observation may or may not lead, for example, to a trend-over-time insight, but the primary focus remains capturing a deep understanding of users in the present time.

Nevertheless, it is apparent that there exists among design thinkers a general awareness that sectors and industries are subject to constant change and often rapid and surprising shifts, so it is not surprising that we find evidence of interest in strategic foresight in the design thinking literature. In the context of design thinking, Kjaersgaard et al. (2016) comment that one needs to discuss "futures". Pollastri et al. (2016) report on the use of scenarios as a method to foster visual conversations on research future design applications (see also Shumack, 2014). While Lawson (2005) has said imagining design solutions means to project a divergent context from what exists, so any design endeavor embraces the assertion of an alternative future. Observation of (the limitations of) embedded mental models, a core foresight process, can be observed in Christensen & Schunn (2009). Relevance of foresight for design thinkers is supported by design thinking that goes beyond the remit of product and or service innovation, into an approach that "can help strategic and systems innovators make the new worlds they've imagined come to pass" (Brown & Martin, 2015). At this level, where design thinking is involved with organization strategy renewal, Sato et al. (2010) have described how Hewlett-Packard "exploited design thinking to support change, envision the future, and enhance portfolio planning". Beyond even this, design thinking is sometimes put at the service of transformative visions for social innovation or long-term change. For example, Scupelli et al. (2016) report on the integration of futures thinking with design thinking in the context of university education.

In these various conceptualizations, we find design thinking recognizing the need to take stock of future uncertainty and to create foresight intelligence as part of enacting successful designs. However, while design thinkers may apprehend some benefits from structured future-oriented thinking, there is currently no framework for design processes that enables this. It is into this circumstance that we seek to make an intervention: we aim to clarify how strategic foresight approaches may augment design thinking, and to build a new model without disturbing the fabric or underlying philosophy of design thinking methods.

This paper proceeds as follows: in Section 2, we summarize the rationale and processes of design thinking, and address the core vulnerability ("faster horses problem") that pertains. In Section 3, we outline key principles and practices of strategic foresight, and detail where and how these augment design thinking perspectives. In Section 4, we build a model for the part-integration of strategic foresight into design thinking, followed by discussion and conclusions.

Design Thinking: The Status Quo

We have referred above to the foundational and most commonly accepted process models for design thinking. Beyond this we also note that while there is

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variation in the specifics, there is considerable agreement across the field as to the key steps as well as the rationale behind them. Foundational codifications in such texts as Beckman and Barry (2007), Brown (2008), Martin (2009), or Liedtka & Ogilvie (2011), rest on an end-user-centered "build to learn" process, with phases of inspiration, ideation, and implementation. Seidel & Fixson (2013) observe three elements: need-finding, which encompasses the definition of a problem or opportunity through observation; brainstorming, which is a formal framework for ideation; and prototyping, which involves building models to facilitate the development and selection of concepts. For Liedtka (2015), rigorous experimentation is used to sift through the many possible solutions that are produced by rapid ideation in the design process.

In view of the essential similarities of these models above, and in the interest of simplicity, we choose to use one model from among those cited in section 1, which covers the mainstream of design thinking methods. It also provides a template against which to address the need for and potential role of strategic foresight. This analysis may equally be worked out with another of the design-oriented models.

The Stanford D-School model, chosen here for its widespread recognition, puts the elements and

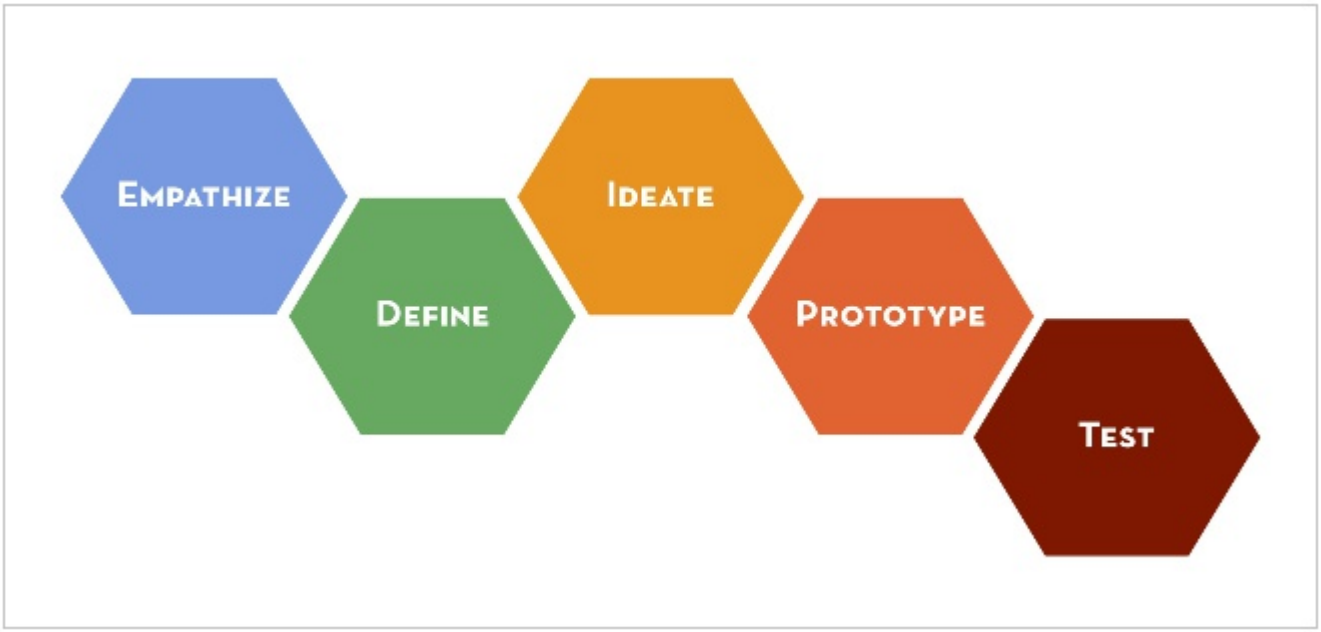

Figure 1: Steps in the Design Thinking Process. dschool.stanford.edu/resources

Empathy: a process of observing users' preferences and discovering their needs, both overt and latent. This may also be described as 'need-finding,' 'deep listening,' or undertaking a learning journey to tune into users' behaviors, preferences, and needs.

Define: this phase builds on an awareness of peoples' needs and preferences, towards developing insights into what their core problem is that seeks a solution, or what opportunity is to be pursued.

Ideate: here the design thinker or team develops ideas for solutions, according to a process whereby judgment is suspended, and both quantity and quality of options is encouraged.

Prototype: this involves narrowing the ideation results toward a rough, early solution to a specific problem, which can be rendered as a sketch or model or early working solution. Prototypes convey an idea and solution quickly, and allow it to be appraised and improved.

Test: this forms part of an iterative process of learning what works and what doesn't, modifying the basic prototype until it is ready to move into production and enterprise forms, and all of the ensuing scale-up.

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The 'Faster Horses' Problem

Taking the model above, particularly the "empathize" and "define" steps, strategic foresight would term what design thinking does here (particularly in its observatory, outward-bound character) as a "learning journey" (Milojevic & Inayatullah, 2015). This may be part of a broader externally-oriented "horizon scanning" (Konnola, et. al., 2012) process. In this, strategic foresight has learned much from the attention and rigor that design thinking brings to such activities, as observed in Section 1 above and detailed further below. But at the same time, for strategic foresight, the observing phase is built on a much broader foundation, that looks well beyond end-users needs, preferences and pain-points, to include also the contextual forces in technology or regulation or other external social, market or industry changes that surround users. This may come to result in a change of their preferences, or to limit or enlarge their possibilities, or to reveal new pain points. The scanning and learning process, in other words, seeks an overall picture of the scope and extent of external change within and around the user and user communities.

Analysing external change-forces and their potential outcomes as completely as possible addresses the fundamental problem associated with close observation of consumers, including empathy with their preferences and pain points, which is the 'faster horses' problem. It is said that Henry Ford, of Ford Motor Company, when asked about his lack of attention to end-user observations or surveys, commented: "If I had asked *them* what they wanted, they would have said faster horses!" There is evidence that the attribution is apocryphal, but the problem it refers to is paramount in the strategic foresight field: consumers cannot be relied on to envisage "leap" solutions, nor therefore to express need or preference for them. This is to say, end-users will not escape their current mental models when considering future preferences. They cannot reliably be expected to know what technology or other contextual forces may entirely upend the solution field, nor when this may happen. Neither will close observation of their needs and preferences necessarily reveal this.

The implication is that, while close consumer observation and empathy is important, it is not sufficient on its own. Technology breakthroughs, as well as regulatory or industry shifts, for example, may at a stroke render preceding consumer observation and empathy work redundant. No amount of consumer observation prepares the design thinker for end-user preferences in reshaped or "disrupted" sectors. Consumer observation alone is brittle and vulnerable to significant, sudden change. The context surrounding usage and users may suddenly become quite different from that of today. Put another way, the "empathy" and "define" stages of design thinking rest on the assumption that no major disruptive elements will change the solution set during the period being designed for. They assume a more-or-less status-quo context, or constant gradual change along the current path. History shows, however, that this is a highly vulnerable assumption. And it puts vulnerability to disruption, along with the element of surprise, at the heart of the design thinking process, as currently conceived.

In the Ford automobile example referred to above, a combination of new technologies triggered a new mobility system that satisficed greater user need for mobility, and also stimulated new needs. Continuing the theme: shortly after the introduction of the automobile, one of its pioneers, Gottlieb Daimler, observed that "the global demand for automobiles will not surpass 1 million —if for nothing else due to a lack of chauffeurs" (Borg, 1999). With over 60 million vehicles sold every year, and currently an estimated one billion cars around the world, the error of this view illustrates, once again the weakness inherent in a close focus on user needs. Rapid development of ease-of-use standards in operating automobiles meant that the user "need" for a chauffeur was only 'real' until, quite suddenly, it was not.

Solving the "faster horses" problem therefore means anticipating leaps and discontinuities as well as continuities and "evolutions" in this contextual environment. The tools and methods of strategic foresight, detailed below, have been developed specifically to provide this. This requires a different set of evaluative processes that what is currently available in most design thinking tool kits. The tools and methods of strategic foresight, detailed below, have been developed specifically to provide this.

Strategic Foresight

Strategic foresight as a field has emerged since the 1950s. It was pioneered by the French "La Prospective" school (Godet & Durance, 2011), Herman Kahn at the U.S. Rand Corporation in the 1960s, Donella Meadows and the Club of Rome adaptation of systems modelling in the *Limits to Growth* study (Meadows, 1972) in the

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1970s, a decade which also saw early success in use of scenario planning by Pierre Wack and Royal Dutch Shell (Wilkinson & Kupers, 2013). The tools and approaches of the emerging field were extensively categorized by Wendel Bell in the 1990s (Bell, 1997), while the case for foresight in company management thinking particularly was made by Hamel and Prahalad (1994). See also updated reviews of approaches and practices in the field, notably by Hines and Bishop (2007), Rohrbeck et al. (2015), and Iden et al., (2016).

Over this time, there have been many definitions of the purpose and mandate of strategic foresight. For this paper, we adopt the definition by Richard Slaughter (1997), which is broadly representative of the field. Strategic foresight is:

> "the ability to create and maintain a high-quality, coherent and functional forward view and to use the insights arising in organisationally useful ways; for example: to detect adverse conditions, guide policy, shape strategy; to explore new markets, products and services. It represents a fusion of futures methods with those of strategic management."

Although there are many subdivisions and specializations in the field, some generic and foundational positions are evident. First among these is that strategic foresight particularly turns its back on any concept of a predictable future, and on all activities that try to predict the future, including forecasting by data projection and extrapolative modeling. Modeling of past data to predict future outcomes is fatally vulnerable to even small shifts in underlying assumptions (Makridakis & Taleb, 2009), or only reliable under stable, slow-moving change conditions (Courtney et al., 1997). Therefore it is completely inadequate to the task of future thinking in open, complex situations (Cornelius et al., 2005; Cuhls, 2003; Gavetti & Rivkin, 2007; Gordon, 2009), such as those that both future-thinkers and design-thinkers typically face. In its antipathy to prediction of any kind, the strategic foresight field orients itself to future preparedness by way of qualitative, exploratory and narrative tools that expand decision-makers' recognition and perception of plausible outcomes. This allows them to investigate implications and test future solutions (Berger et al., 2008).

Second, and related, the foresight field seeks to broaden our approach to the future from the activity of merely deducing "most likely" or "most probable" future situations. Instead, we are invited to consider less likely but still plausible and possible outcomes, which is valuable both in mitigating surprises, and in drawing attention to assumptions and potential blind spots in decision-making. Third, it is also fundamentally agreed that the purpose of foresight is not simply to build tools for use at a future time, but rather for use today, and to improve thinking about choices in the present moment. Foresight serves this purpose by stimulating perception of alternative outcomes, so as to expand the range and depth of strategic assessment, and therein improve decisions to better fit the future. In this, strategic foresight broadens and deepens the strategic decision-making process from its traditional steps, as diagrammed below. The top line represents the standard predictive planning process and the lower line the strategic foresight.

The lower line emphasizes the need for deeper analysis, and even more importantly, consideration of multiple contextual scenarios and the ensuing alternative strategies. Such alternative strategies also imply alternative innovation systems, for example, in the automobile industry, when considering both car-based mobility, and mobility as a service (where a smartphone provides access to optimal multi-modal mobility, that may include, ride hailing, bicycles, e-scooters, etc.). This emphasis on plurality is key to overcoming the cognitive bounds of actors (Gavetti, 2012), enhancing decision-making quality, and increasing organizational agility (Lehr et al., 2017).

Steps in Strategic Foresight

Over 60 years of practice and theory in the strategic foresight field have provided various encapsulations of the steps that characterize good foresight processes. While there are many such iterations, there is also broad agreement as to necessary steps and best practices. Similarly to the summary of design thinking process above, the brief representations of strategic foresight below should be taken as broadly representative of the field, rather than as a singularly agreed method.

The Association of Professional Futurists (APF), a key scholarly and professional body in the foresight field, defined six steps in achieving strategic foresight competence, after a five year study 2011-2016. This was reported in Hines et al. (2017), based on, and updating, Hines and Bishop (2007). The steps are:

Framing: defining a focal issue and current conditions;

Scanning: exploring signals of change;

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Futuring: identifying baseline and alternative futures;

Visioning: developing and committing to a preferred future;

Designing: developing prototypes, offerings, or artifacts to achieve the vision and goals;

Adapting: enabling organizations to generate options to alternative futures.

Rohrbeck and Kum (2018) have put forward a "3Ps" (Perceiving, Prospecting and Probing) foresight process model, which covers similar terrain, and which is also broadly representative of the strategic foresight process, but extends it with particular attention to the phase of probing, or, in design terms, "prototyping" and "testing" (ref. Stanford D-School model, above.) We will now address this 3Ps model in more detail, before turning to how it may be integrated with design thinking.

Perceiving

Perceiving means identifying evidence of change in the environment external to the organization and seeking to understand and interpret it. Sometimes also known as "horizon scanning", or "environmental scanning", or simply "radar", this is the structured activity of looking for signals that indicate what and where external changes are occurring. These signals are often technological progress events, but may also include social or market changes, or legislative shifts. They may be landmark events that signify important junctures and new trajectories (Ansoff, 1980), or may be peripheral "weak signals" (Day & Schoemaker, 2005), the implications and importance of which are as yet unclear. When examined, many "surprises" have clear antecedents, and the perceiving phase creates vigilance to such. Attention to parallel sectors or across geographies is also intrinsic to the process because scanning rests on the concept that "the future is already here, it is just unevenly distributed" (a quote attributed to the science fiction writer William Gibson). Scanning sometimes uses the mnemonic STEEP or PESTEL (political, environmental, social, technological, economic, legislative) to prompt the necessary width of coverage through which the process gains value. In some cases, there is payoff for an organization to identify such signals ahead of competitors, therein gaining a lead-time advantage. But more often the benefit of the scanning process comes in orienting leadership attention towards developing threats or opportunities in the external environment, rather than being lulled into a "business-as-usual" view of the future.

Further, a properly managed perceiving phase would also recognize, "while it's one thing to look, it's another thing to see". In other words, the process of perception demands attention to the perceptual frames that the viewer inescapably brings to the perceiving process. Such frames or "paradigms" or "mental models" are made up of embedded assumptions, heuristics, or biases, that cause scanning evidence to be mentally filtered in or out, or only partially recognized, or interpreted in a weighted or skewed way (Gavetti & Rivkin, 2007). While there can never be a "pure"

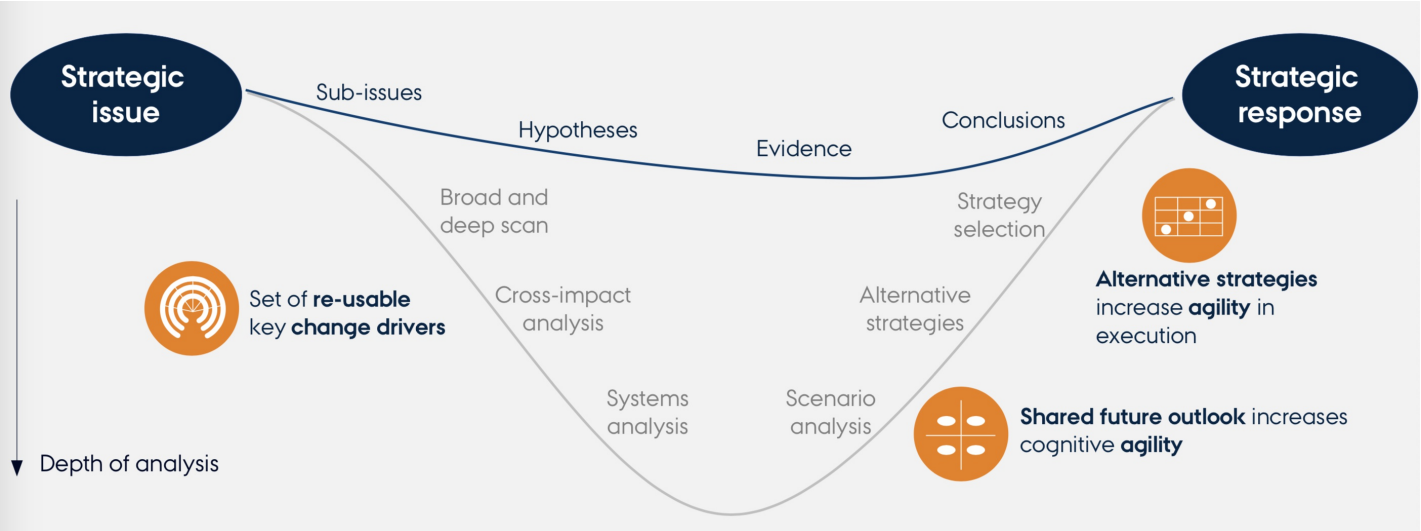

Figure 2: Strategic Foresight vs. the Traditional Strategy Process. (Rohrbeck, Etingue Kum, Jissink, & Gordon, 2018.)

perception, the conscious bias of self-questioning calls attention to the perceiver's cognitive foundations and limitations, including the very common tendency to notice more prominently and value more highly information that accords with one's own view. Likewise is the tendency for perception to norm to a widely held group viewpoint, or to conform with a judgment previously made or invested in.

Prospecting

Once signals and data are gathered, various activities are used to make sense of them, to understand their patterns and the implications for change (Daft & Weick, 1984). The prospecting phase refers to the practices of (a) making sense of the many signals that perceiving captures, towards formulating an informed and reflective understanding of the present and expected future as pertains to the particular issue or situation under study, and (b) casting forward to create non-predictive narratives or hypotheses of the various important ways the future may unfold. The first practice is achieved in part by assembling the data over time to the present time. This provides trend recognition, as well as understanding of the presence or absence of future validity in these trends (Gordon, 2010). Prospecting is also achieved by investigating the systemic forces and feedback loops that structure and limit change in the situation under study (Meadows, 2008), and further by exploring the deeply held beliefs, myths and metaphors (Inayatullah, 1998) that underpin contemporary societal representations. Likewise, these practises pay attention to various preferred or aspirational activities (Godet, 1982; Ogilvy, 1992) that different stakeholder groups have, as well as their relative power to enact these.

With as robust as possible an understanding of the present, strategic foresight turns mentally casting forward into the future in a non-predictive way. This may include applying a variety of methods among which are Delphi studies (Dalkey & Helmer, 1963), cross-impact analyses (Helmer, 1977), futures wheels (Glenn & Gordon, 2009), or technology road mapping (Phaal et al., 2004). Systems dynamics also has a role here, in helping future-oriented thinkers to understand why some events may have large or even exponential change implications and others lead to no change at all. Likewise, in explaining lag between change forces and their subsequent effects (Sterman, 2001). This process sometimes takes the form of "backcasting" (Robinson, 1990), that is, filling in backward from a potential future outcome in order to show how the present may happen to reach that outcome, including actions innovators may make to bring it into being if they have the institutional or industry power to do this (Thorén & Vendel, 2019). Backcasting therein illuminates necessary decisions, resources, capabilities, (and in this context, design innovations) required to reach towards a specific future end-state.

Among forward-thinking tools, the most commonly used and best known is scenario planning. Scenarios are narratives of what the future may look like (with reference to the situation or sector under study) given particular foundational assumptions and a particular path of evolution (Durance & Godet, 2010). The point of

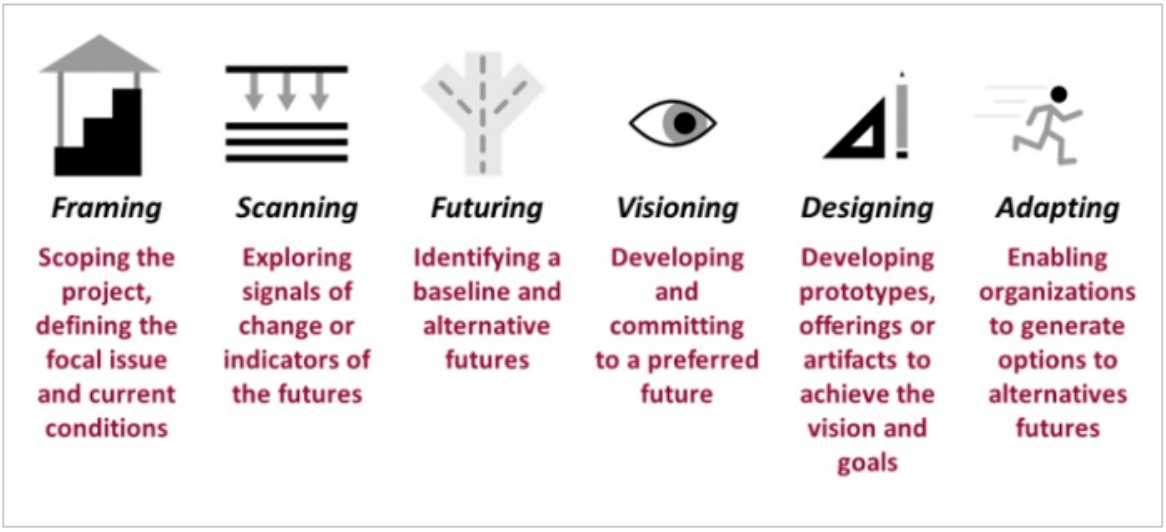

Figure 3: Steps in Strategic Foresight. Association of Professional Futurists. apf.org

scenario planning is to vary these assumptions and paths so as to create a spread of alternative future narratives none of which is predicted, but which are all plausible. Each of these scenarios has different implications for the organization, therein challenging management thinking (Gausemeier, et al., 1998; Schoemaker, 1993). Generally, scenario time horizons will be circumspect, in the range of 5 to 15 years, though longer views are not uncommon. Longer time horizons sacrifice immediacy, but relax the strictures of "what is possible" and so invite and enable stretch thinking. One of the early proponents of scenario planning, Herman Kahn, referred to scenarios as "thinking the unthinkable" (Kahn, 1960), that is, giving specific attention to outcomes at the limits of plausibility. Scenarios are built to provoke thinking and stimulate conversations, that is, to "ideate" in design thinking terms. Chermack & Coons (2015) have viewed them as thought trials or trial balloons which work in the same way design prototypes do: inviting speculation, feedback, and learning. Thought trials (Weick, 1989) are a set or series of conjectures about a variety of possible solutions to a given problem.

Probing

Whether they are fully materialized beyond scenario form or not, views of the future can be turned into decisions, innovations and strategies in various ways. They allow decision-makers to assess whether their current or imminent plans are robust across different plausible contextual situations (van der Heijden, 1996), and what opportunities and threats a non-continuous future may present. This suggests innovation of products, services or solutions such as may be required (Mietzner & Reger, 2005). A future different from today, and from what is commonly anticipated, often stimulates bridge-thinking: "What would be needed in this scenario? What problems will users or society as a whole face, and how may these be resolved? What are the new opportunities and how might these be provided, or sourced, or built? Who would 'win' in this scenario, why and how?" All of these questions are asked in the face of a particular plausible. All of these questions, when asked in the face of a future scenario, may provoke innovative and imaginative leaps whose use is not necessarily confined to that scenario.

If the idea passes tests of initial interest and internal approval, a company may develop a "probe" study to investigate how it might be given concrete shape, and be brought to user and market readiness (Gausemeier et al., 1998). Probing aims at testing and legitimizing a new course of action, and preparing the ground for scale-up and roll-out. But it stops short of full roll-out of the solutions that would commit the company to the solution before the plausible future in view actually manifests. Probes stimulate and gauge user feedback, and create a learning cycle of iterative refinement of the product or service with users, that is, via probing, firms move from "cognitive search" to "experimental search" (Gavetti & Levinthal, 2000). Probes may include R&D projects or acquisitions, product or service prototyping, internal venturing, experimenting in trial markets, creating intrapreneurship units or internal venture funds, "accelerator" units running consumer tests, and so on (McGrath, 2001, Michl et al., 2012, Rohrbeck et al., 2009).

Towards a Foresight-Informed Design Thinking

When placed in a side-by-side comparison, it is apparent that the probing phase of strategic foresight has much in common with the prototyping and testing (build-to-learn) phases of design thinking. This overlap and congruence is no accident. Strategic foresight theorists and practitioners have absorbed build-to-learn into their approach over the past decade, based on exposure to design thinking. There is now also a common call for "ethnographic" approaches, characterized by listening to end-users and creating a learning cycle with them. For example, Day & Schoemaker (2016) advise "probe-and-learn" experimentation in the foresight process, by which they mean rapid prototyping or quasi-experimental designs that explore new strategic initiatives and pave the way for sequential investments. This requires "a willingness to be immersed in the lives of current, prospective, and past customers [and] exploring and identifying latent needs or learning from lead customers." (Ibid)

Foresight has also embraced the benefits of "rendering." This means giving tangible form to concepts as a way of exploring and refining them, either in the probing phase or in constructing future views themselves. It is not uncommon for scenarios these days to be rendered, that is, manifest in visual or assembly form, rather than narrated. Also, in congruence with the processes and culture of design thinking, strategic foresight is almost always created in groups, via a "messy" process that values heterogeneous expertise and diversity of inputs. Notably, in activities such as these, foresight also joins design thinking in viewing its methodological rationale as "a craft" that guides practitioners towards ideas and improvements, rather than identifying as a scientific process that produces "answers." As with all crafts,

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despite an overall lack of methodological exactitude, a set of firm, underlying, repeatable principles that lead to better outcomes is held as common knowledge. It takes skill, practice and experience to execute these.

Building on these many commonalities, the processes of strategic foresight may be harnessed in the service of producing design thinking outcomes that are future-informed and future robust, as follows:

a. Scanning for external change factors that goes beyond attending to the end-user, therein considering the full force-field of external change influencing a particular situation. Such scanning includes orientation both to weak and strong signals, and also clear attention given to perceptual frames and biases. The benefit is that the design thinker will be able to anticipate contextual changes that the common end-user is unlikely to be aware of, and that observation of or empathy with that user will not necessarily reveal.

b. Creating a high-quality understanding of the present, and critical view of the expected future. This involves sorting and evaluating change forces, recognizing trends, and considering in what ways and how strongly they may drive the future. It therefore also implies evaluating the force and longevity of these trends rather than merely assuming continuance of their past

Table 1. Design Thinking and Strategic Foresight

Design Thinking process. Representative model: Stanford D-School	**Strategic Foresight process Representative model: Three P's Framework**	**An Integrated, Foresight-informed Design Thinking process**
1. Empathize Observe users' preferences and discover their needs, both overt and latent. This is also described as need-finding or deep "listening", or as undertaking a learning journey to tune into users' behaviours, preferences, and needs.	1. Perceive: Scanning Look for signals that indicate changes occurring in the external environment. Address the full force-field of change that will influence future outcomes within the relevant domain. This activity includes giving attention to and mitigating perceptual frames that degrade observation.	1. Empathize and Perceive Attend to user observation and empathy, but also expand observation to include scanning the full force-field of change factors in the external environment (while addressing the limits of perceptual frames in both activities).
2. Define Consolidate insight into what the core problem is to seeks a solution, or opportunity to be pursued.	2 Prospect (a) Sensemaking Interpret the evidence from the perceiving phase, understand its patterns, and build an informed understanding of the present, including implications for change. This involves sorting and evaluating change forces, looking at the strength of trends and to systemic, cultural or political forces that facilitate or block change. Prospect (b) Futuring Cast forward to create non-predictive narratives investigating alternative plausible future outcomes. This step involves fleshing out or otherwise reifying the different ways that important external forces may change the contextual environment. Key assumptions and development paths are varied, to create alternative future narratives to alternatives outcomes, each of which has different and important implications for design decision-making in the present.	2. Prospect then Define Interpret the evidence from the Empathize and Perceive phases, to build an informed understanding of the present, both from the user point of view and with reference to macro-externalities and potential leap solutions. Advance this understanding into alternative views of the future non-predictively, within which to consider the design problem. Therein develop a robust view of plausible future contexts that the design thinking process is addressing. Once this basis is achieved, define the design problem to be addressed or opportunity pursued.
3. Ideate Develop a wide range of solution ideas to the problem or opportunity defined.		3. Ideate Develop a wide range of solution ideas to the problem or opportunity defined. In addition to standard design ideation, use non-predictive alternative views of the future, containing alternative users and different needs, to stimulate and enhance ideation.
4. Prototype Narrow the product or service ideation toward an early solution, rendered as a sketch or early working model, allowing it to be appraised and improved.		4. Prototype As before, narrow the product or service ideation toward one or a small number of prototypes.
5. Test Follow an iterative process with users to learn what works, modifying the prototype until it is ready to move to final phase and scaled-up.	3. Probe Select from and test new courses of action via a process of experimental searching that looks for tangible proof of the potential success of new ideas and iteratively refines the emerging solution.	5. Probe and Test The iterative probing, testing, and refining step proceeds as before.

trajectory, and attention to underlying systems that facilitate or block change, as well as to the power dynamics among different stakeholders who may have different future aspirations and capacity to bring this into being. The benefit to the design thinker is in arriving at a sophisticated view of the future that the design-thinker is attempting to create for, and therefore which designed solutions are more vs. less likely to find adoption with users in the future.

c. Investigating alternative plausible futures. This involves structured thought experiments, most commonly in the form of scenarios, to investigate different ways the external context relevant to the design thinking challenge may change. Note that scenarios here are not about how a decision or a design experiment may play out. They are rather about the ways the contextual terrain in which the design has to function in the future may differ, which will make different demands of the design. With various scenarios in hand, the design thinker escapes the trap of designing for the present, a "most probable" future context, or a hoped-for future context, and is instead thrust into apprehension of alternative contexts. This either stress-tests current design solutions for robustness, or presents different outcome situations that stimulate ideation (or both.)

The following table describes the parallel processes of design thinking and strategic foresight, and how they may be brought together to create a future-informed, design thinking process.

Conclusion and Implications

The purpose here has not been to amalgamate design thinking and strategic foresight. These are different methodologies, set up to resolve different types of problems and achieve different goals, and should remain so. Our purpose instead has been to document and expand our understanding of the many intrinsic commonalities between the two fields, and their associated methodologies, already recognized and applied in strategic foresight, and to insert this understanding into the design thinking process. For this purpose, we have discussed the benefits of strategic foresight, and argued that this takes design thinking beyond reliance on user observation, and therein helps to mitigate its vulnerability to significant or unforeseen contextual changes. We have also shown that sense-making and prospecting in the arena of contextual change, and casting this forward in non-predictive scenarios, may also in itself be a basis for innovative thinking. We have also shown that sense-making and prospecting in the arena of contextual change, and casting this forward in non-predictive scenarios, may also in itself be a basis for innovative thinking. The aim is that this may feed into innovation processes and innovation management, and also provide a source of advancement for design thinking.

Beyond demonstrating motivation for and benefits of inserting strategic foresight methods into the design thinking process, we have also attempted to demonstrate how this can be done. For this purpose, we brought a side-by-side comparison of representative models from each field, and showed how these may be assembled together in practice to create foresight-informed design thinking. The suggested framework brings academically and practically validated strategic foresight processes to design thinking, while also respecting the integrity of the design thinking model as-is, thus adding to it rather than seeking to revise it. Practically speaking, design thinkers and innovation managers now only require the motivation to insert strategic foresight into their ideation and innovation processes, and they will find a framework available for them.

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