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How to anchor design thinking in the future: Empirical evidence on the usage of strategic foresight in design thinking projects

Jan Oliver Schwarz [a,*], Bernhard Wach [b], René Rohrbeck [c]

[a] Bavarian Foresight-Institute, Technische Hochschule Ingolstadt, Esplanade 10, 85049 Ingolstadt, Germany
[b] Hochschule München University of Applied Sciences, Am Stadtpark 20, 81243 München, Germany
[c] EDHEC Business School 24, Avenue Gustave Delory, CS 50411, 59057 Roubaix Cedex 1, France

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ABSTRACT

Many organizations use design thinking (DT) to develop future products and services. DT is often used for its ability to serve as a common "language" and platform to enable market-facing departments and technology-oriented units to cocreate innovations. DT has been shown to be a powerful tool for helping to identify and connect the needs of average customers (personas) with technical solutions that form the basis for winning products. In this paper, we investigate the extent to which DT professionals already use strategic foresight (SF) methods that anticipate future customer needs and highlight emerging technologies to expand classical DT and anchor their projects in the future. Using survey data on 302 DT projects, we report on the extent to which SF methods are used in DT projects, the overriding types of SF methods in DT projects, and their impact on project success.

1. Introduction

Design thinking (DT) has made its way into a variety of organizations and is attracting increasing attention in academia (Pitsis et al., 2020). DT has been described as an integrative framework bringing together creative and analytic modes of reasoning accompanied by a process, a set of tools, and respective techniques (Liedtka, 2015). The most prevalent definition describes DT as a human-centred innovation process, emphasizing aspects such as observation, collaboration, fast learning, visualization of ideas, rapid prototyping, and a mix of analytical and intuitive thinking (Micheli et al., 2019). Despite a multitude of different views and literature streams for the present study we build on three key elements suggested by Seidel and Fixson (2013) that characterize DT: first, needfinding, encompassing the definition of a problem or opportunity through observation; second, brainstorming, a formal framework for ideation; and third, prototyping, building models to facilitate the development and selection of concepts.

DT is problem-centric and is therefore firmly anchored in the present. It not only provides insights gained from existing customers' current behaviours and needs but also tackles new product development (Gordon et al., 2019). Similarly, the technology-oriented departments that become involved in the DT process remain almost entirely anchored in the present and contribute by drawing on current technologies, thereby failing to leverage emerging and future technologies to create opportunities for innovative implementations. Specifically, DT falls short to address future challenges, customer needs, and emerging technologies. Hence, DT alone might be inappropriate to generate future-oriented solutions and ground-breaking innovations such as the VCR recorder, the smartphone, or electric mobility.

* Corresponding author.
E-mail addresses: JanOliver.Schwarz@thi.de (J.O. Schwarz), bernhard.wach@hm.edu (B. Wach), rene.rohrbeck@edhec.edu (R. Rohrbeck).

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To address rapidly changing environments, also referred to as environments that are volatile, uncertain, complex, and ambiguous (VUCA), organizations need to develop capabilities that allow them to refresh their competitive advantage, i.e., dynamic capabilities (Teece et al., 1997). It has been shown that strategic foresight (SF) is an important element of dynamic capabilities (Rohrbeck et al., 2015), as respective practices allow firms to identify, observe, and interpret factors that induce change, determine possible organization-specific implications, and trigger appropriate organizational responses that are powerful means to enhance their innovation capacity (Rohrbeck & Gemünden, 2011; Schwarz, Rohrbeck, & Wach, 2020). However, Beckman (2020) argued that there is little research on how the practice of DT fits with other approaches, such as agile development, lean startups, scientific methods, Six Sigma, critical thinking, and systems thinking. From the perspective of foresight, specifically, scenario planning, we do not find much evidence of research relating to design (Tiberius et al., 2020), with very few exceptions (Buehring & Bishop, 2020; Gordon et al., 2019).

To contribute to this ongoing debate, we argue that the integration of DT and SF can be beneficial and practically relevant, particularly once intending to produce meaningful solutions and products for the future. SF has been found to support the dynamic capabilities of companies, particularly in environments characterized by high uncertainty (Haarhaus & Liening, 2020; Semke & Tiberius, 2020). Furthermore, (Fergnani, 2022) built a model that shows that SF provides different elements to the dynamic capabilities of a firm. Similarly, it has been demonstrated that DT contributes to the dynamic capabilities of businesses (Appleyard et al., 2020; Kurtmollaiev et al., 2018; Liedtka, 2020).

It has also been argued that designers need to go beyond current customer needs and incorporate future behaviours and requirements into the design process (Evans, 2014). However, how exactly that can be accomplished and how designers can address the lack of substantiation of future customer needs remain unclear. Mozuni and Jonas (2017) argue that the Delphi technique combined with a morphological analysis could help designers to integrate SF into their design process. Different terms have been coined to describe these combinations of DT and SF, including "Foresight by Design" (Buehring & Liedtka, 2018), "Strategic Design" (Buehring & Bishop, 2020), "Design-Led Strategy" (Knight et al., 2020), "Anticipatory Design" (Celi & Colombi, 2020), and "Design for the Speculative Future" (Dong et al., 2020). Given the attention to this field in both theory and practice, we intend to extend respective knowledge. Hence, in this paper, we investigate to what extent SF methods are used in DT projects. By drawing on empirical data derived from 302 design thinkers, we identify overriding types of SF methods in DT projects and demonstrate their impact on project success.

2. Theoretical background and research framework

2.1. Typology of design thinking

DT is derived from practice and is leading to multiple perspectives; it can be defined as a process of creative strategies (Visser, 2006; Dorst, 2015) or a human-centred, iterative and problem-solving approach (Liedtka, 2015), or a consolidation of practices (Collopy, 2019). Detailed definitions and types of DT vary by research area and school. The HPI School of Design Thinking (Brenner, 2013), for instance, suggests six steps: understand, observe, point of view, ideate, prototype and test. Liedtka (2015, p. 3) argues that based on the practice at firms such as IDEO or Continuum and the way in which educators at the Stanford Design School, the Rotman School at the University of Toronto, and the Darden School at the University of Virginia use DT "specifies an initial exploratory phase focused on data gathering to identify user needs and define the problem, followed by a second stage of idea generation, followed by a final phase of prototyping and testing…". To maintain a broader perspective for our research, we follow three elements suggested by Seidel and Fixson (2013), i.e., need finding, brainstorming, and prototyping. Being aware of the different concepts and perceptions of DT we deliberately pursue a broad perspective in the present paper to particularly encompass prevalent and practically popular DT activities.

2.2. Relevant SF methods in DT projects

To focus our research, two criteria were guiding for us: First, frequently used methods in SF, and second methods that are frequently mentioned in the literature on DT to deal with the future. Initially, we assessed the different types of foresight methods and their

Table 1
Methods to deal with the future in design thinking.

Method	Publication
Design fiction/Cultural products (e.g., *Science Fiction*)	Bleecker (2009); Blythe & Wright (2006); Coulton et al. (2016); Schwarz & Wach (2022)
Drawing on *intuition* to think about the future in the context of design	Fulton Suri (2008); Beckman & Barry (2007); Lewrick et al. (2018); Liedtka (2011, 2015); Micheli et al. (2019); Buehring & Liedtka (2018)
Using *visual artefacts* to imagine future scenarios	Kimbell (2011)
Scenarios (in a boarder sense); the *vision-cone* is mentioned in this context	Gonçalves et al. (2014); Scupelli et al. (2016); Mozuni & Jonas (2017); Lewrick et al. (2018); Pollastri et al. (2016); Brown (2009); Sangiorgi & Scott (2014); Vallet et al. (2020)
Delphi method	Mozuni & Jonas (2017)
Trends/trend analysis	Mozuni & Jonas (2017); Celi & Colombi (2020); Lewrick et al. (2018)
Speculative futures	Dong et al. (2020)
Future user	Lewrick et al. (2019)

respective level of use in extant literature. Popper (2008) provides a ranking of methods according to prevalence stating that literature reviews (477 cases), expert panels (440 cases), and scenarios (372 cases) are widely used, followed by trend extrapolation/megatrends (223 cases) belonging to the commonly used methods. These widely and commonly used methods except backward-oriented literature reviews overlap with Rohrbeck's (2010) process of SF which is based on three phases: perceiving, prospecting and probing. The perceiving phase is particularly dominated by trend research and the prospecting phase is characterized by developing scenarios. It has further been argued that these two approaches are fundamental to developing foresight (e.g., Rohrbeck & Schwarz, 2013; Schwarz et al., 2020). Moreover, we find evidence of trend research and scenario planning being the most used methods in corporate foresight (Schwarz, 2008). A perspective which is also supported by an even more recent study on corporate foresight practices at Finish firms, describing scenario planning and trend research, besides long-range planning as the three most used methods (Huuhanmäki et al., 2022). Furthermore, we investigated DT and design research literature to understand which methods are mentioned to investigate the future. In Table 1, we summarize our findings with respect to the methods mentioned in the context of DT and design research to deal with the future.

As a consequence for our future-focused study we concentrate on the prevalent methods identified by Popper (2008) deliberately excluding ex-post oriented literature reviews and enhance this set of methods by innate futurist methods of intuition and experience or knowledge of the future as well as science fiction novels and movies that occurred frequently in the scientific discussion (e.g., Bleecker, 2009; Coulton et al., 2016; Micheli et al., 2019; Buehring & Liedtka, 2018).

Putting this into perspective, Reeves et al. (2016) argue that even though all designers need to take unknowability into account, studies of design have only occasionally, with a few exceptions (e.g., Yelavich & Adams, 2014; Candy & Potter, 2019b), addressed its relationship with foresight or futures. Others have argued that design should not only be about making things aesthetically more appealing, making devices smarter, or enhancing the usability of user interfaces but should also be used to develop solutions to major challenges, such as combating climate change or inequality (Peschl & Fundneider, 2016). Dong et al. (2020) state that design can employ speculative futures, a technique known to futurists and used to create reference points for planning probable, plausible, and preferable futures. Furthermore, design authors, such as Kjaersgaard et al. (2016), make reference to 'futures' in its plural form, which acknowledges a core assumption of SF that the future exists in the present only in its potentiality and the future as it will present itself is shaped by human agency. Hence, in the present, we should avoid predicting the future and instead explore potential futures that we can work towards or work to avoid (Kjaersgaard et al., 2016; Vecchiato, 2012).

Other scholars follow a different path and point out the similarities in objectives between DT and SF (Buehring & Bishop, 2020; Candy & Potter, 2019a). At the Stanford Center for Design, an SF framework has been developed, which establishes a relationship between DT and SF (Lewrick et al., 2019). Steckelberg (2015), for instance, argues that scenario and design work support a team's learning and creativity in similar ways since both create something new. Gordon et al. (2019) add that foresight advances DT by providing insight into the needs and preferences of the users of tomorrow, creating a framework for foresight-informed, design-based innovation.

While some authors highlight similarities between design and scenario work (scenario planning) (Steckelberg, 2015; Selin et al., 2015), we find that scenarios as approaches are frequently mentioned. We further find evidence of drawing on scenarios to initiate design processes targeted at innovating urban futures (Pollastri et al., 2016) or report on the integration of futures thinking with DT in developing future options for university education (Scupelli et al., 2016). Similarly, Brown (2009) describes scenarios as being a part of DT. In their work on transformative visions, Sangiorgi and Scott (2014) report that part of the design for social innovation and long-term change in co-developing scenarios is based on a wider strategy and a network of individual projects that work synergistically.

Furthermore, we find mentions of the method trend research. Trend research (Liebl & Schwarz, 2010) is rooted in Ansoff's (1975) work on weak signals and the concept of environmental scanning (Aguilar, 1967; Daft et al., 1988). The main assumption is that changes in the business environment of a firm do not happen overnight but develop over time, in some cases, over longer periods. This assumption implies that a trend may develop from a weak signal to a strong signal over time. This process has also been described as the life cycle of trends (Liebl & Schwarz, 2010), while others have referred to searching for weak signals as scanning the periphery (Day & Schoemaker, 2005, 2006). Trends which are perceived as more impactful as other trends have also been conceptualized as megatrends (von Groddeck & Schwarz, 2013).

While different approaches to creating scenarios exist (Bradfield et al., 2005), it may be argued that the main purpose of scenarios is to create alternative, plausible pictures of the future, allowing organizations to challenge their assumptions about the future and to prepare for it. In relation to SF, it has been argued that trend research and various forms of developing scenarios are fundamental methods for advancing foresight (Rohrbeck & Schwarz, 2013; Schwarz, 2008; Schwarz & Liebl, 2013). Therefore, we have included **structured scenario planning approach** and **trend research** as relevant methods in our inquiry.

From the beginning, SF has leveraged the insights of experts. In particular, the Delphi method, developed by the RAND Corporation, works with multiple rounds of expert surveys to anticipate future developments, to establish plausible time frames for their emergence and to identify the underlying factors that drive developments (Armstrong, Green, & Graefe, 2015; von der Gracht, 2012). In our context, we avoid placing constraints on the process of identifying SF methods by defining the method too narrowly. However, we aim to use the methods involving experts, which we also find in the literature on DT that can provide information about the futures in the DT process. Consequently, we use **expert interviews** as an additional method.

The use of cultural products, such as science fiction, has gained recognition in both SF (Schwarz, 2015; Schwarz et al., 2014; Schwarz & Liebl, 2013) and design. In this context, Bleecker (2009) coined the term 'design fiction'. Design fiction has been described as an approach for speculative design that involves future-oriented prototypes (Coulton et al., 2016). Similarly, Blythe and Wright (2006) report on the usage of fiction to explore user experience under the label of 'pastiche scenarios', and Schwarz and Wach (2022)

find evidence of the positive impact of using cultural products in DT projects. Most of these scholars use science fiction with its rich description of future worlds, their new technologies and new behaviours, the needs of the protagonist, and their internal consistency to inspire innovative products and service concepts. However, another function associated with science fiction movies and novels is providing moral, political and technological commentary on the present and to offering a perspective on how to shape the near future. An apt example is the urge for engineers to work on the development of mobile phones that was arguably driven less by an existing customer need and more by the concept of staying connected anywhere that was introduced in the Star Trek series, where a 'communicator' allowed the protagonists to remain in contact with each other even if they were on another planet. A related method used in DT is science fiction prototyping (Schwarz et al., 2014; Schwarz & Liebl, 2013). We thus conclude that a further method of SF that can be applied in a DT process is **science fiction movies and novels**.

The notion can be found in the literature on DT (Beckman & Barry, 2007; Buehring & Liedtka, 2018, 2011; Lewrick et al., 2018, 2015; Micheli et al., 2019), that the intuition and experience or knowledge of those involved in projects concerning trends and the future play a role. We refer here to individuals who either have experience working with trends or who are particularly skilled at detecting trends. It has been argued in the context of customer foresight (Eller et al., 2020) that so-called trend receivers (Schweitzer et al., 2019; Hofmann, 2015) are individuals who tend to perceive new trends earlier than others. While we are aware that using the intuition and experience or knowledge of the future of those involved in DT projects are not established methods, still we judge that **intuition and experience or knowledge of the future** are relevant in this context and should thus be included in our empirical investigation.

3. Empirical investigation

3.1. Research approach

To investigate the extent to which SF methods are used in DT projects, the types of SF methods that are prevalent in DT projects, and their impact on project success, we decided to survey DT professionals. We used the social media network Linkedin to acquire survey participants, which is described as the world's largest online professional network. It has been used for scientific data collection (Baruffaldi et al., 2017; Ecleo & Galido, 2017), and it has the additional advantage of allowing us to further qualify respondents through public profile information.

The survey was conducted in 2018 and addressed 1352 design thinkers. We searched for the term "design thinking" and received a total of 302 responses, a rate of 22.3%. More than half of the respondents (57%) claimed to have five years of experience in DT projects, and 31% reported having at least 10 years of experience. Three-quarters (75%) were employed by for-profit organizations. In terms of organization size, 25% of respondents came from very large organizations (more than 9999 employees), 21%, from large organizations (250−9999), 11%, from medium-sized organizations (50−249), 16%, from small organizations (10−49), and 27%, from micro-organizations (1−9). Nearly half of the design thinkers in the survey were in Europe, whereas the other half was almost evenly split between North America, Australia, and Asia; only a few participants were from South America and Africa.[1]

Measurement details regarding "approaches to dealing with the future" are provided in Table 2. We informed the respondents upfront that we wanted to understand which approaches are used in DT projects to uncover customers' latent needs. Furthermore, we intended to identify which approaches are applied when DT projects must address the future and its accompanying uncertainty. We collected responses on a 7-point Likert scale. To capture the systematic and regular usage of the methods, we aggregated the responses into no (1, 2, 3, 4, 5) and yes (*agree* - 6 and 7).

To obtain indications of the SF methods' contribution to success, we assessed the extent to which the methods have contributed to the overall success of the DT project. Again, we applied a 7-point Likert scale. To capture the systematic and regular usage of the methods, we aggregated the responses into no (1, 2, 3, 4, 5) and yes (*agree* - 6 and 7).

3.2. Findings

One aim of this study was to obtain a better understanding of the profiliration of SF methods. The results are displayed in Fig. 1. First and foremost, our results reveal that foresight methods are used more intensively in DT projects than we had expected based on our literature review. In particular, the usage of scenario planning was unexpected. However, the low level of usage of science-fiction novels and movies is noteworthy. Judging by the popularity of science fiction among the tech entrepreneur elite, for example Elon Musk, Sergey Brin, Jeff Bezos (Stadler, 2022), we expected a higher number of users in our sample.

In practice, we experience the usage of multiple SF methods rather than a single SF method to address present challenges (Rohrbeck & Schwarz, 2013; Schwarz, 2005; Schwarz et al., 2020). It is unlikely that experts draw on a single method only; in fact, experts are applying multiple methods or deliberately a bundle of methods. In addition, the methods are not fully distinct and can actually overlap to a certain degree in practice. Therefore, we explore the overriding types of SF methods by conducting an exploratory factor analysis. The aim of the analysis is to identify independent elements. In our case, we aimed to evaluate whether all the methods are loaded onto one factor, which would suggest they perform the same function, or whether the factor analysis identifies more than one factor, in which case we should further investigate the specific function the methods perform. To this end, we first examined the correlations that

[1] The data collection adhered to recent European data protection standards.

Table 2
Item measurement.

Questions	Response format
What approaches do you use to deal with the future in design thinking projects? Structured scenario planning approach Trend research Expert interviews Intuition and experience or knowledge of the future Science fiction novels and movies	Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree)
To what degree have these tools contributed to the success of the projects? Structured scenario planning approach Trend research Expert interviews Intuition and experience or knowledge of the future Science fiction novels and movies	

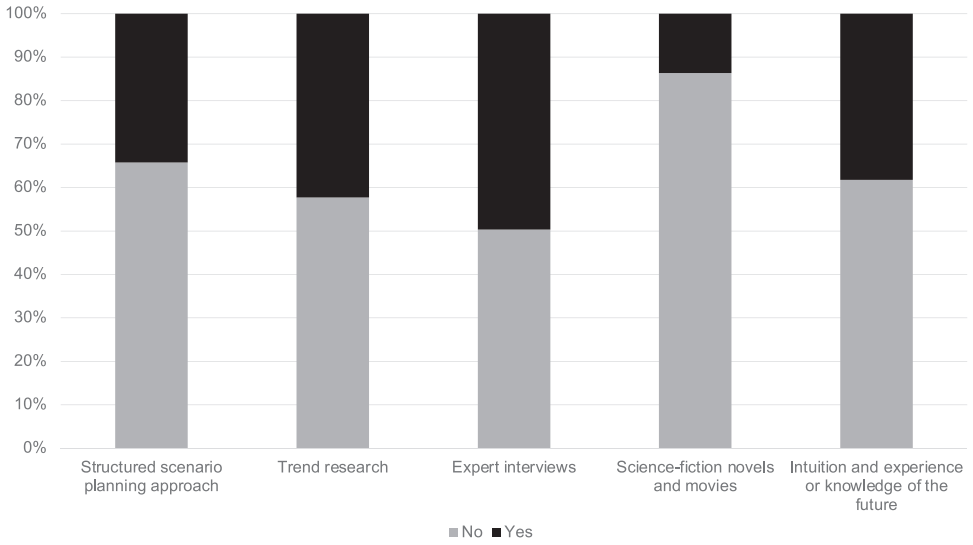

Fig. 1. Pervasiveness of methods used in dealing with the future in design thinking projects.

range between small and medium-sized values (Hair et al., 2010). The highest correlations occur between structured scenarios and trends and megatrends ($r = 0.37$) and between expert interviews and intuition and experience ($r = 0.34$). The details are shown in Table 3.

First, we performed both the Kaiser–Meyer–Olkin test and Bartlett's test of sphericity. The Kaiser–Meyer–Olkin value is appropriate (KMO = 0.65). Bartlett's test of sphericity is significant and indicates that the sample is suitable and contains sufficient correlations among the variables (approx. chi-square = 155.11, df = 10, $p \leq 0.01$). Second, we conducted a principal component extraction to reduce the number of items into factors. We followed prevalent extraction guidelines and calculated Kaiser's criteria (eigenvalue > 1). Kaiser's criteria displayed two factors demonstrating a cumulative percentage of variance of 59.36%, which is considered acceptable (Hair et al., 2010; Merenda, 1997). Third, based on these findings, we performed principal component analysis for extraction. The rotation method was varimax with Kaiser normalization. The factor pattern matrix is displayed in Table 4.

To foster a rigorous approach and to test whether the two factors provide a better model fit than one factor, we conducted an abridged confirmatory factor analysis (CFA) in SPSS AMOS. The CFA of Model 1 included the two factors (Factor 1: 1. structured scenario planning, 2. trends and megatrends, 3. science fiction novels and movies; Factor 2: 1. expert interviews, 2. intuition and experience or knowledge of the future) and provided results that were acceptable in overall terms ($\chi^2 = 13.74$; $df = 4$; $p = 0.008$; $CFI = 0.93$) (Bentler, 1990; Hair et al., 2010). Model 2, which consisted of only one factor (1st factor: 1. structured scenario planning, 2. trends and megatrends, 3. science fiction novels and movies; 4. expert interviews, 5. intuition and experience or knowledge of the future), provided worse fit values ($\chi^2 = 30.49$; $df = 5$; $p = 0.000$; $CFI = 0.82$). Hence, we found support for our two-factor approach.

Comparing the empirical results with the SF literature, we concluded that Factor 2 (Type 2) consists of methods that allow *human-based* insights into the future to be captured. Factor 1 (Type 1), however, concerns *systematic* methods that make it possible to stretch the scope of the options under consideration. Trend research often involves extrapolating trends. A trend such as the sharing economy, in which customers prefer to rent, pay per use, or lease a product as opposed to owning it, is projected into the future and helps design thinkers to envision attractive value offerings that build on this principle in markets where the principles of the sharing economy have

Table 3
Correlation matrix of SF methods.

Variables	*n*	*M*	*SD*	1	2	3	4
1. Structured scenario planning approach	294	4.62	1.68				
2. Trend research	295	4.98	1.56	0.37			
3. Expert interviews	296	5.29	1.37	0.18	0.30		
4. Science fiction novels and movies	295	3.28	1.82	0.25	0.28	0.13	
5. Intuition and experience or knowledge of the future	295	4.87	1.56	0.11	0.16	0.34	0.27

n = sample size; M = mean value; SD = standard deviation; company size is the natural logarithm of the number of employees. Correlations with absolute values above 0.15 are statistically significant at $p \leq 0.01$.

Table 4
Factor pattern matrix of SF methods.

Variables	1	2
1. Structured scenario planning approach	0.81	
2. Trend research	0.76	
3. Expert interviews		0.74
4. Science fiction novels and movies	0.57	
5. Intuition and experience or knowledge of the future		0.85

Values < 0.30 are not displayed.

not yet been widely adopted. Similarly, structured scenario planning systematically stretches the imagination of design thinkers by forcing them to innovate in often opposing directions. Science fiction novels and movies that often take innovative technologies as a starting point, which, for example, provide abundant, cheap green energy, similarly stretching the scope of design thinkers beyond the known boundaries of existing technologies.

The results are displayed in Fig. 2. The fact that expert interviews achieved the highest score might indicate the ease of use and usability of this method. It might also relate to a specific insight gained from expert interviews that provided a particularly useful part of the overall solution, product, or service. The second impactful method is the scenario planning method. As discussed in the theory section of this paper, there are several documented cases of design processes leveraging classic scenario planning. There are also examples where customized approaches are tied to personas, storyboards, or visioning methods. Given the long track record of scenario planning, we postulate that the application of the method is well rehearsed in organizations and that it is easy to apply, as team members would have basic or even advanced knowledge of its application. The usage of trend research is also associated with a high positive impact on project success. We suggest that it is also well understood in many industries. Considering the popularity of trend work in design processes, the reported impact might even highlight some challenges involved in extracting value from trend research. Furthermore, we experienced a limited contribution of science fiction novels and movies to project success, which can be related to the low level of usage. Further, we conducted a robustness check by correlating the respective SF methods with their respective contributions to project success. The results showed overall positive and significant correlations.[2] Hence, even the less prevalent methods, for instance, science fiction novels and movies, are significantly correlated with project success. Thus, the overall picture is positive, pointing to the useful involvement of SF methods in DT projects.

4. Discussion

In this investigation, we find that design thinkers use specific SF methods, for instance, scenario planning or trend management, in their projects and that these methods make a distinct contribution to the success of these projects. Following the dynamic capabilities approach, organizations tackle growing uncertainty by elaborating on routines and capabilities, for example, in the form of foresight and DT, to modify the organization's resource base (Eisenhardt & Martin, 2000; Teece et al., 1997).

Our empirical investigation allows us to assess to what extent SF methods are applied in DT. As we find conceptual ideas on combining DT and SF in the extant literature (e.g., Steckelberg, 2015; Gordon et al., 2019), we also discover a limited number of studies on the usage of SF methods in DT, predominantly deriving from a design perspective (e.g., Buehring & Bishop, 2020; Knight et al., 2020; Celi & Colombi, 2020). However, our empirical investigation reveals that in practice, DT foresight methods are more frequently applied and that they contribute to the success of DT projects to different degrees. Hence, our study advances both a better understanding of the relationship between SF and DT and respective insights embedded in related innovation literature (e.g., Adegbile et al., 2017; Rohrbeck & Gemünden, 2011). Further, the present study contributes to the field of design methods and related practices (e.g., Seidel & Fixson, 2013). Contrary to prevalent literature on DT, however, we bridge the gap between theory and practice and find that approaches from SF are more frequently used than expected.

Building on the positive correlations of SF methods with their respective contributions to project success we conclude that the

[2] We experienced moderate to strong and overall positive correlations that were highly significant ($p < 0.01$).

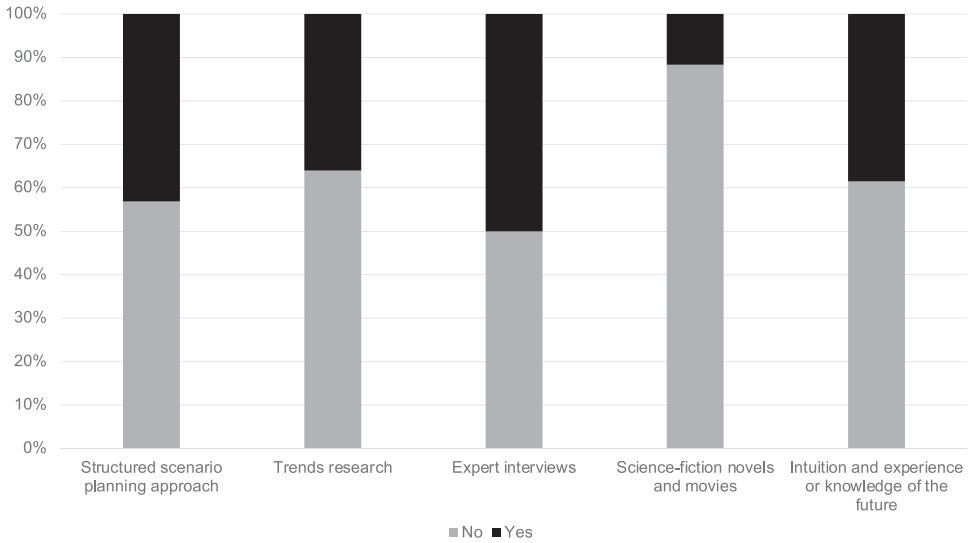

Fig. 2. Future-oriented methods' contribution to project success.

toolbox of design thinkers should also be expanded by prevalent methods from foresight, particularly trend research or scenario planning. This notion also ties into a recent practical study deriving from a European top-tier polling agency that assessed the contribution of foresight. Based on the responses of 400 senior executives from large Europe- and U.S.- based companies, multiple methods are surveyed particularly future scenario reports, technology roadmaps, trend reports, future customer journeys, regularly updated trend databases, scenario workshops, and foresight or future knowledge platforms (Buder, 2020).

Furthermore, we find that DT projects which apply methods from SF are perceived as being more successful. This asks for the stronger integration of SF methods in DT projects. While we have only focused on a few SF methods, the exploration of further methods of SF in this context could be promising. However, if DT projects are concerned with the future, they should deliberately refer to how trend research can be carried out or how trends can be conceptualized (Liebl & Schwarz, 2010). Using structured approaches to developing scenarios, such as scenario planning (van der Heijden, 2005), should be explored as an approach in DT projects.

5. Limitations

There are four limitations associated with this study. First, the dataset is based on individual respondents. Hence, there might be a risk of single-respondent bias. However, responses are less biased if the respondent is the most knowledgeable person in the organization to answer the questions (Gerhart et al., 2000). Considered that we deliberately approached knowledgably experts for our sample we perceive that the threat of single-respondent bias is limited.

Second, there could be a concern about self-selection bias in terms of the identification of survey respondents. As people choose to have a presence on Linkedin, self-selection bias is possible (Baruffaldi et al., 2017). Nevertheless, considering the prevalence of Linkedin in scientific data collection (e.g., Baruffaldi et al., 2017), we deem our approach to be appropriate.

Third, this study did neither address different stages or types or applications of DT nor its complexity. Given that studies of design have only occasionally, with a few exceptions (e.g., Yelavich & Adams, 2014; Candy & Potter, 2019b) addressed DT in association with foresight or futures (Reeves et al., 2016) our primary intention was to contribute to a better understanding in this regard in general. Hence, we pursued an initial survey in this field combining DT and SF that allowed us to be among the first to extend respective knowledge. Further, scholars state that DT comprises a basket of diverse tools and processes enhancing the difficulty to measure it precisely asking for a structured academic attempt to capture popular practical procedures and approaches (e.g., Liedtka, 2015). One must be aware that these challenges go beyond the scope of the present study, however, future research could take a more detailed approach also incorporating various stages, types or applications of DT.

Fourth, we look at the intercept of SF and DT and contribute to structuring the complex and fuzzy field of diverse practical methods. Nevertheless, we cannot detail specifically which of these methods to give preference over others, when to apply it or how frequently to use it. Hence, there are further avenues for future research.

6. Conclusion

DT has pervaded many areas of management. By combining analytical thinking with creativity, we see the potential for understanding how other disciplines can enhance DT. In this investigation, we find that design thinkers use specific SF methods, for instance, scenario planning or trend management, in their projects and that these methods make a distinct contribution to the success of these projects. Moreover, we contribute to knowledge about the impact of SF methods to project and performance goals and find support that

all selected methods contribute to project success. Scholars and practitioners will profit from the overall finding suggesting the useful involvement of SF methods in DT projects. We thereby extend Rohrbeck and colleagues' seminal work on SF and the associated relevance of context specifics in relation to firm performance (Rohrbeck & Kum, 2018) and to design (Tiberius et al., 2020). The findings of the present study imply that additional investigations might be necessary to understand exactly how methods such as scenario planning have been applied in DT, for instance, by carrying out qualitative in-depth interviews or case studies. From our perspective, this would also include an assessment in what stages of a DT projects which SF methods can be applied but also exploring the usage of SF approaches in other design practices. This could also include investigating the usage of further SF approaches in DT. In addition, future studies should determine a suitable environment in which these measures can thrive and have a meaningful impact. Moreover, research on foresight and DT would also benefit from expanding its scope to other interdisciplinary approaches, such as entrepreneurship. In addition, it has been argued that insights from social psychology into thinking in the DT process can inform and inspire the process (Thompson & Schonthal, 2020). Further research could explore how methods involving foresight, in relation to which similar discussions have taken place (Schwarz, 2007).

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