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Scenario-based strategizing: Advancing the applicability in strategists' teams

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ABSTRACT

For over 40 years, scenarios have been promoted as a key technique for forming strategies in uncertain environments. However, many challenges remain. In this article, we discuss a novel approach designed to increase the applicability of scenario-based strategizing in top management teams. Drawing on behavioural strategy as a theoretical lens, we design a yardstick to study the impact of scenario-based strategizing. We then describe our approach, which includes developing scenarios and alternative strategies separately and supporting the strategy selection through an integrated assessment of the goal-based efficacy and robustness. To facilitate the collaborative strategizing in teams, we propose a matrix with robustness and efficacy as the two axes, which we call the Parmenides Matrix. We assess the impact of the novel approach by applying it in two cases, at a governmental agency (German Environmental Ministry) and a firm affected by disruptive change (Bosch, leading global supplier of technology and solutions).

1. Introduction

Established organisations typically have well-rehearsed strategic decision-making methods that work well in stable environments. Through tenure, they have learned the rules of the game in their respective industries; through day-to-day competing, they have learned how to gain competitive advantages; and through regular benchmarking exercises, they have learned how to develop their business towards a winning configuration. When, however, the stable environment is disrupted and radical market and/or technology shifts occur, organisations can quickly find themselves in situations where their traditional strategy formation methods fail (Gavetti and Rivkin, 2007; Ringland, 2010). Such radical changes may lead to what Schumpeter would refer to as 'creative destruction', and dealing with these changes requires more than traditional strategy formation processes and tools (Schumpeter and Opie, 1934).

In shifting environments, firms prosper that are able to find and successfully compete for superior opportunities. The scenario technique has been advocated for its ability to inform strategic decision-making in environments that are both complex and uncertain (Gausemeier et al., 1998; Schoemaker, 1993; Walsh, 2005). Examples include business model, site- or production-planning, product portfolio-planning, negotiation, or market-entry strategies in the private sector and sectorial policy development, crisis/conflict prevention, and international development strategies in the public sector. We add that for the scenario technique to be truly impactful, we need to improve its applicability in collaborative strategizing, in particular in top management teams that have limited time. We argue that the success of novel strategies that permit attainment of superior positions in the industry will ultimately depend on the level of shared understanding and commitment in the top management team. Hence, we need approaches that facilitate direct participation of the management team that is responsible for setting the course of action.

One of the first and to-date best documented applications of the scenario technique is Shell's scenario exercises in the 1970s. These exercises permitted Shell to foresee and prepare its business for a potential rise in oil prices. When a sharp oil price increase occurred, as a consequence of the Israeli-Arab conflict, Shell was better prepared than its competitors and able to significantly improve its competitive position (Jefferson, 2012; Wilkinson and Kupers, 2013). Following the inspiring example of Shell, many firms started to adopt different variants of the scenario method (Malaska et al., 1984; Linneman and Klein, 1983). In most of these examples (including Shell), the scenario planning is run by specialized staff units that tend to work independently and share the

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final outcome with decision makers.

Henry Mintzberg likes to make the point that strategy is ultimately about creativity (seeing the options) and synthesis (deciding on a superior course of action) and not about analysing data (Mintzberg, 1994a). In consequence, planners (i.e. the staff units collecting data, providing analysis, etc.) should support the process, but forming strategy should be left to the managers (Mintzberg, 1994b). The role of the scenario technique (possibly supported by planners) would thus be to boost the ability of (top) managers to identify superior courses of action that are different from the status quo and to foresee the consequences (Gavetti and Menon, 2016).

In line with other recent authors, we define strategizing '*as a process of inference, resembling multiple hypotheses formation and the selection of one or more alternatives from an infinite range of options*' (Calabrese and Costa, 2015). Whilst much of the literature on strategizing refers to 'the leader' as the object of research, our approach focuses on team-based strategy formation (Calabrese and Costa, 2015; Poarc and Thomas, 2002; Gavetti, 2012). Hence, we will use the term 'strategizing team' as the entity of our approach.

In this article, we set out with the assumption that scenario planning needs to be further improved to allow the strategizing team to self-run or at least participate more actively in the process, rather than leaving it to the planners (Mietzner and Reger, 2005). It has also been emphasized that in general, scenario planning and strategy formation should be further integrated (Wright et al., 2013; Tapinos, 2012). In this article, we introduce a novel variant of scenario-based strategizing, which we call the 'Parmenides Matrix' approach. We present the generic approach, discuss two application cases, and assess the benefits of the approach. It permits the direct involvement of private or public sector managers, which we will call strategists from here on, in the analysis process, and it provides the platform on which strategy formation can be built by using external data, tacit knowledge, and the intuition of the strategists.

2. Challenges in scenario-based strategizing

2.1. Fundamental challenges

When Henry Mintzberg calls for strategy formation to be driven by creativity rather than reliance on past data, he emphasizes the need to overcome the formal rationality, often the norm in traditional strategic planning exercises (Gavetti and Menon, 2016). The call also resonates with the observation from Cyert and March, in their 1963 book, that managers emphasize short-term, feedback-based learning rather than aiming to anticipate long-term events and their consequences (Cyert and March, 1963). Strategizing in uncertain environments has to build on strategic foresight, i.e. the ability to identify a superior course of action, which is different from the status quo, and foresee its consequences (Gavetti and Menon, 2016). Based on the seminal work of Cyert and March, the behavioural strategy identifies three bounds that need to be overcome to form a superior strategy. In our article, we use these bounds to measure the impact of scenario-based strategizing (Gavetti, 2012):

- The *rationality bound* results from dominant representations within industry clusters. In other words, firms within an industry tend to perceive the world around them similarly and, in consequence, tend to see the same opportunities, which are then not sufficiently attractive as all competitors are targeting the same market position. In scenario-based strategizing, we expect that the systematic identification of change drivers and strategic options will help to overcome the rationality bound.
- The *plasticity bound* results from inertia, which can have cognitive or physical roots, i.e. firms might fail to act on opportunities because they fail to see how they could (cognitive inertia), and organisations could lack the resources and capabilities to act on the opportunity (action inertia). Scenario-based strategizing may help here by providing strategists with a platform to engage in cognitive search, which is not bound by what is feasible and what is known (Gavetti and Levinthal, 2000).
- The *shaping-ability bound* is tied to the inability to legitimise both the conceptualization of the environment and/or the new course of action. Scenario-based strategizing can help to enhance the shaping ability and, through participation, create a shared future outlook and a sense of ownership in the strategizing team.

At this point, we conclude that scenario-based strategizing, if executed effectively, may contribute to overcoming the three cognitive bounds. There are, however, additional procedural challenges to consider.

2.2. Procedural challenges

Goodwin and Wright (2001) present five general conditions that a formal strategy evaluation procedure should meet: transparency, ease of judgement, versatility, flexibility, and theoretical correctness. The notion of *theoretical correctness* not only covers mathematical and conceptual ('model-theoretic') correctness, but also the effective reduction of cognitive biases (Armstrong et al., 2015; Ehrlinger et al., 2016). Education of decision makers has shown not to be sufficient to compensate for potential negative effects from cognitive biases (Hodgkinson et al., 1999). Scenario planning can help and has been attributed a positive effect on decision quality compared to more traditional tools (Meissner and Wulf, 2013).

Scenario planning reduces different types of decision-related biases, such as confirmation bias and overconfidence (O'Brien and Meadows, 2013). When groups collaborate to make decisions, we also have to deal with the (stochastic) bias and the general discussion bias that favours preference-consistent information (Schulz-Hardt et al., 2006; Mojzisch et al., 2008). Harries (2003) notes that scenario-based decisions create '*understanding of the interaction between the actions, goals and knowledge of the individual organisation and the environment in which they are operating*' and thus can be expected to contribute to enhancing decision quality. In addition, the vested self-interests of group members or dominant group leaders may favour poor alternatives. From practical experience, transparent step-by-step and group-based evaluation procedures that require fact-based argumentation are means to control such behaviour.

From a meta-cognitive perspective, a decision-making approach needs to maximise the likelihood that all relevant accessible insights in all of their manifestations (such as data, perceptions, stakeholder or employee experience, and knowledge) have been utilised. Furthermore, in order to stay *transparent*, the approach needs to provide information about where the different insights have been used.

Ram and Montibeller (2013) highlight the need for more group decision-making methods that also work across hierarchical levels. Decision-making problems in scenario planning typically involve subjective evaluations. Subjective evaluations are frequently criticised for their lack of traceability. Groups have been associated with a reduction of decision quality (Schulz-Hardt and Mojzisch, 2012), particularly due to the lack of intensity of discussions and information processing (Schulz-Hardt et al., 2006). Structuring discussions has shown to have a positive effect.

Visualising discussion content in groups has a facilitation effect on the solution of hidden profiles (situations where the 'correct' choice is not evident from the beginning) and can positively influence the decision time and cognitive costs/benefits (Stasser and Titus, 1985; Gettinger et al., 2013; Comi and Epler, 2011). Orzechowski and Necka (2011) demonstrated that parallel information processing can compensate for cognitive limitations such as memory capacity or attention resources. Nassi and Callaway (2009) carve out the neuroscientific basis of the visual system's parallel processing mechanisms. Larkin and Simon

(1987) compared diagrammatic and non-diagrammatic (sentential) representations in information processing systems and concluded that the topological-geographical relations provided by diagrams (visualisations) are superior to verbal descriptions when it comes to problem-solving. Visualisation shows particular strength in team-based reasoning processes. Comi and Epler (2011) found visualisation to act as a catalyst of inter-organisational teamwork, leading to increased knowledge-sharing quality, team performance, and satisfaction. Montibeller and Franco (2011) propose visual inspection of performances and spreads as the most helpful way of supporting decision makers in multi-criteria decision analysis (MCDA). We thus conclude that effective visualisations should boost, in particular, the *ease of judgement* and the *transparency*.

When applying mathematic modelling of robustness (i.e. a strategy's relative performance across a range of plausible futures) in MCDA models, we encounter additional problems (Goodwin and Wright, 2001). MCDA models confront decision makers with discrete and purely quantitative results (the expectancy value of the 'best option'). The paradox is that while providing grounds for choosing one best option should objectively raise the ease of judgement, typically, it subjectively does the opposite. Strategists cannot only be expected to be frustrated by the black-box phenomenon in which they subjectively lack control over input going into the analysis. Mathematic/model-specific exigencies of models, particularly with an increasing number of scenarios, options, and objectives, quickly overburden our limited working memory capacity (Favato and Vecchiato, 2016). In consequence, the trustworthiness of the recommendation decreases. Maximising the quality of the strategizing process is dependent on how three delicate trade-offs are managed:

1. The amount of insights (qualitative, quantitative, explicit, and tacit, as insights from intuition) that can be integrated in the strategizing process before the levels of tangibility, transparency, and clarity become insufficient (Stewart et al., 2013).
2. The amount of analysis that can be automated and where do strategists need to lead the analysis to create synthesis, for example, in finding ways to optimise robustness and goal-based efficacy.
3. Where the process can be streamlined for efficiency and how we can keep flexibility to add room for detailed and creative discussions about options and choices. The flexibility should also be available to integrate additional stakeholders into the process.

2.3. Constructing the yardstick and designing the approach

In the following section, we will use the yardstick (Fig. 1) to reflect on the process improvements that we suggest. The strategizing quality elements are used to guide the design choices made to define the Parmenides Matrix approach. The five criteria can also be used for further enhancements of the development of variations for different contexts. The impact dimension will be used to reflect on the overall contribution of the scenario-based strategizing in the two application cases.

Scenario-based strategizing has been proposed as the tool of choice in cases with high degrees of uncertainty in the environment and/or about the strategic options (Courtney et al., 1997; Van der Heijden, 2005). Applying the scenario technique permits apprehending possible futures within which actions will need to produce an impact, challenge conventional thinking, and improve decision-making (O'Brien, 2004). Scenario planning entered the field of long-range and strategic planning when environmental uncertainty started to increase in many business sectors in the 1970s (Wilkinson and Kupers, 2013; Rohrbeck et al., 2015). Courtney et al. (1997) argued that firms need to fundamentally change the way they work with strategy when they enter uncertain environments.

When designing scenario-based strategizing approaches, we aim to provide a strategizing space in which strategists can use pre-developed analysis, creativity, and intuition to create synthesis about goals and strategy choices and assess how they will play out in a set of plausible scenarios (Fig. 2). To boost versatility and flexibility, we propose to first analyse the three dimensions (objectives, endogenous drivers, and exogenous drivers) independently. We expect that this will also boost the transparency about where tacit and other sources of knowledge are being brought into the process (Stewart et al., 2013).

3. The Parmenides Matrix approach

3.1. Introduction

When designing scenario-based strategizing approaches, we need to balance the trade-offs mentioned at the end of Section 2.2 and optimise the five criteria defining the strategizing quality. To maximise versatility, flexibility, and complexity tolerance, we propose a disaggregation and individual visualisation of the necessary reasoning process into its essential cognitive steps. The subsequent re-aggregation in a structured, transparent, and accessible 'reasoning architecture' allows the strategizing team to interactively rethink and base conclusions on shared assumptions, cause-effect relationships, and priorities. This modular approach allows for reorganisation of steps as well as the use of different tools and input sources (Kiker et al., 2005). Our approach can be divided into three main phases (see Fig. 3). The situation analysis must be sufficiently systematic to ensure comprehensiveness of drivers and strategic objectives. The strategizing needs to include sufficient time and analytic depth to facilitate a creative and out-of-the-box dialogue among the strategists. The third phase needs to facilitate decision-making in a way that ensures that the strategists can collaborate efficiently and acquire a feeling of ownership (Kiker et al., 2005).

The three phases are further broken down into seven steps. The arrows indicate how the outcome of one step is used as input for the following (firm line). The dotted lines indicate that one step will influence another one. For example, the scenarios will further enhance and influence the definition of the strategic options, but the main input for the strategy definition are the endogenous key drivers. The grey box contains tools that are typically used in the three phases. The portfolio

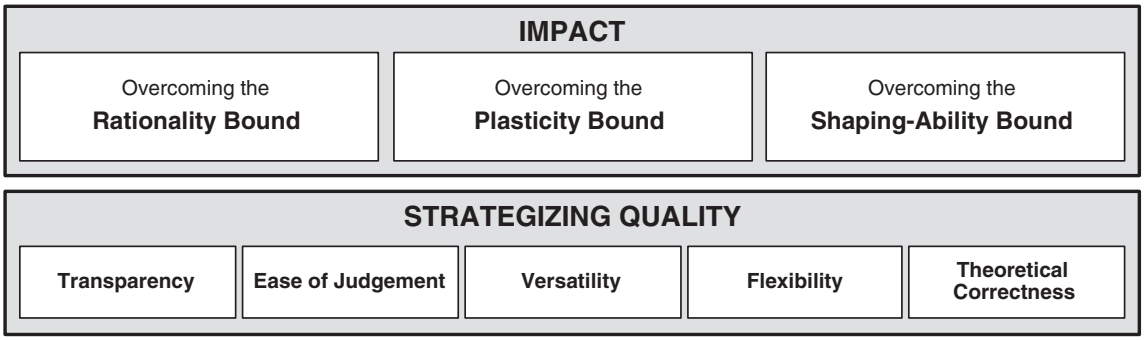

Fig. 1. Yardstick for judging impact and quality of scenario-based strategizing approaches.

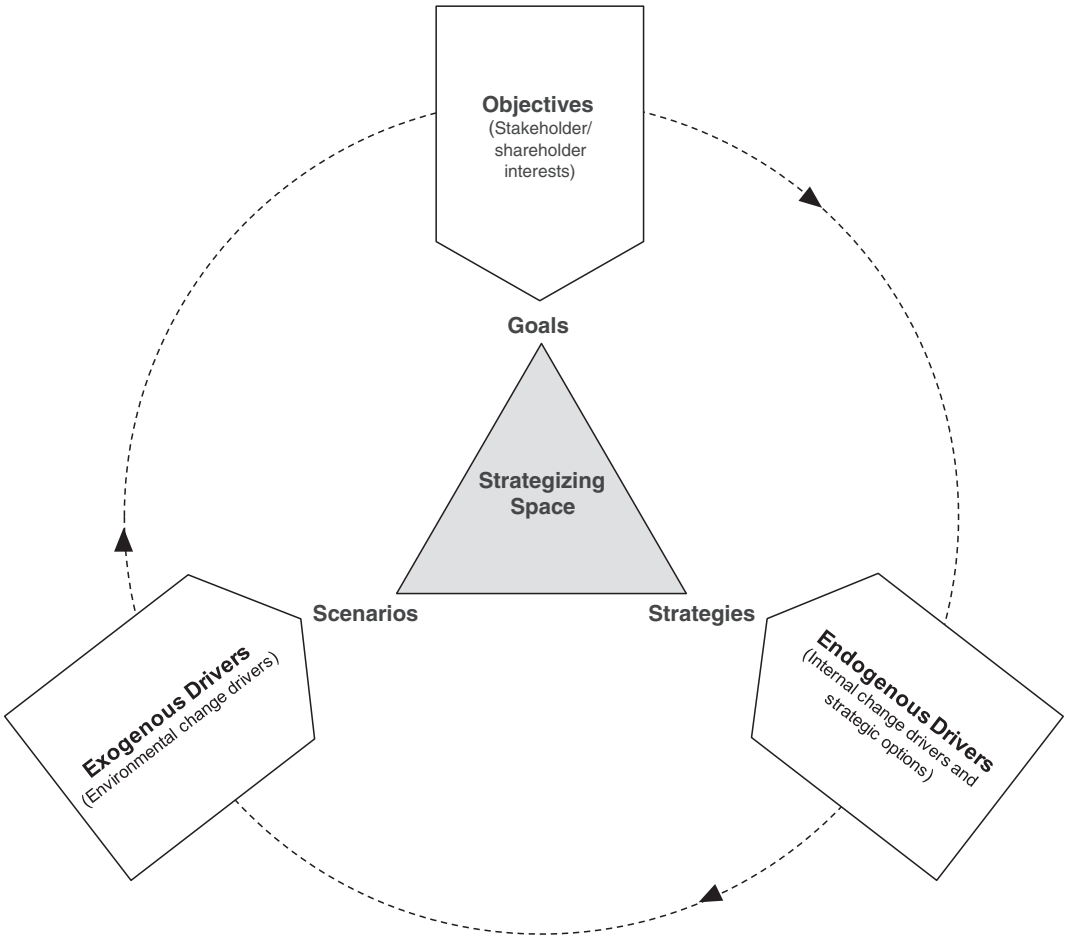

Fig. 2. Elements of a scenario-based strategizing approach.

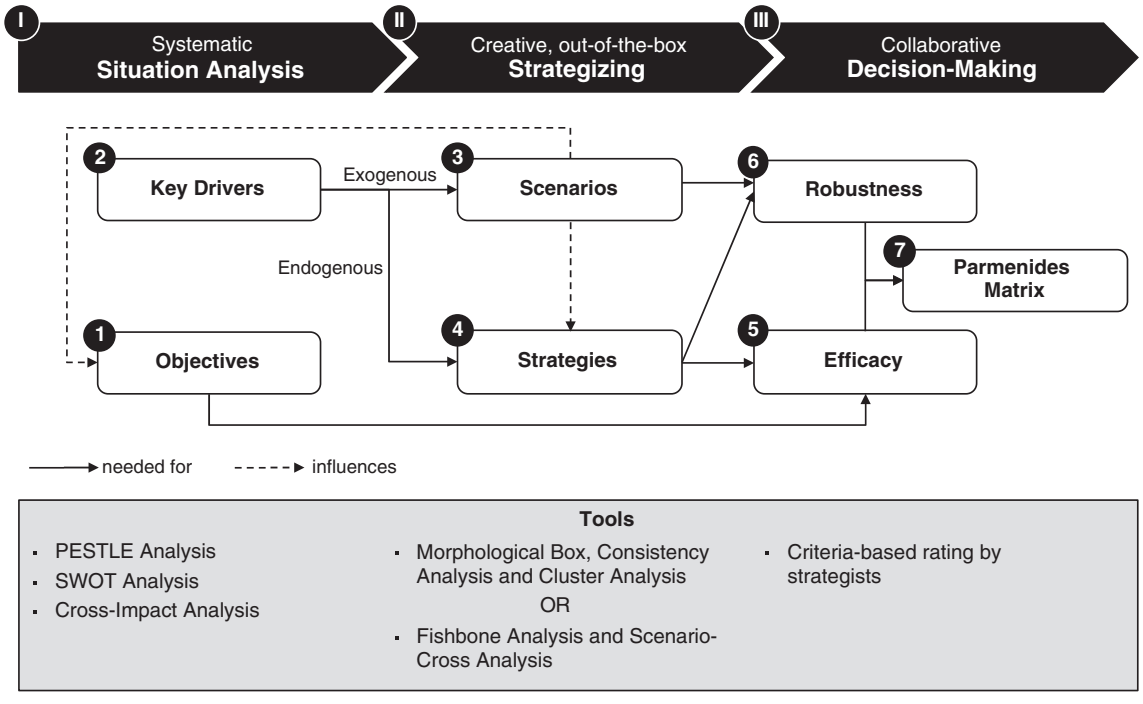

Fig. 3. The Parmenides Matrix approach – overview.

of tools can be customized to match different contexts. For example, strategists with an appetite for more sophisticated tools may opt for using morphological box, consistency, and cluster analysis to define the set of plausible scenarios and consistent strategies. Others who are more comfortable with the intuitive logics (IL) school would manually cluster key drivers using, for example, the fishbone technique and develop scenarios through a scenario cross.

3.2. Process sequence

Before engaging in scenario-based strategizing, it is important to define the time horizon, the geographical reach, and the scope. This will then also determine the suitable team of strategists. For broad scopes and long-term time horizons, it would typically be necessary to add participants from outside the organisation to ensure sufficiently broad and divergent backgrounds. When the different team members should get involved should also be considered. Often, external experts would be involved in the situation analysis and provide further input on strategizing results. The internal strategists would, however, drive the strategizing and decision-making.

Step 1: Objectives. In the first step, the strategists set the strategic goals. The goals can be derived from existing mission or vision statements but need to be specific enough to serve as evaluation criteria. Often, these goals consist of financial goals (e.g. revenue growth, target profitability, minimum free cash flow) and non-financial goals (e.g. reducing carbon footprint, creating societal value). These goals may also be further prioritized by assigning weights. Another definition relates to the time frame. Goal target values and weights can be expected to vary across the short, mid, and long term. For example, a firm may aim to grow aggressively in the short and mid-term, to eventually reach a high profitability and high level of corporate sustainability in the long term.

Step 2: Key drivers. The aim of the second step is to identify a set of change drivers. To ensure comprehensiveness, team heterogeneity is a key. Here, involving experts from other industries (particularly from industries with a long planning horizon, such as architecture) is a promising approach. In addition, frameworks can help, such as using the PESTLE model for environmental factors, or the SWOT framework. This often leads to a long list of change drivers. To identify the most influential drivers, a cross-impact analysis can help (Heger and Rohrbeck, 2012; Porter, 2005). Other alternatives include using a sensitivity or systems dynamics analysis (Vester, 1999). In the final step, key drivers are grouped into factors under the control of the actor (endogenous) and those beyond control (exogenous). The endogenous factors will be used as input for the strategy development and the exogenous as input for developing the scenarios (see also Fig. 3).

Step 3: Scenarios. The key exogenous drivers form the basis for defining the scenarios. The scenarios should ideally reflect all of the residual uncertainty in the environment, i.e. cover the entire scope of plausible futures (Vester, 1999). Traditional IL suggests the consolidation of exogenous drivers into two main dimensions (scenario cross), permitting the identification and description of four scenarios. A more detailed analysis is possible through the usage of computer-aided methods. Here, a larger set of factors can be used, and each factor can be assigned a suitable number of alternative future perspectives. The consistency analysis builds on the input of the strategists, they define which the future perspective of one factor can be expected to be consistent with the future perspective of another factor. This approach enables the generation of scenario clusters that differ in many dimensions. In addition to these two generic approaches, there are manifold alternative scenario techniques, which can all be used within the framework of our approach (Kosow and Gassner, 2008; Schoemaker, 1995). Even the usage of third-party scenarios may be an option (Kosow and Gassner, 2008; Schoemaker, 1995).

Step 4: Strategies. In our approach, the strategic options may be influenced by the scenario development but are independently constructed on the basis of the endogenous factors. The approach is the same as for the scenario construction. In our view, the independent construction of strategies is a key to challenge existing strategies, mental models, and assumptions. By systematically developing consistent alternative strategies, we can reduce the rationality bound. A useful method here is also the general morphological analysis, which uses the endogenous key drivers as dimensions (Ritchey, 2013). In addition, the construction of strategies on the basis of options, rather than as a variation of existing strategies, allows the development of more distant strategies, i.e. strategies that deviate significantly from the status quo. The participation of the strategists already in the scenario development can further boost the distance of the new alternative strategies. The more distant the alternatives, the higher the likelihood of identifying a course of action that creates a competitive advantage (Gavetti and Menon, 2016). The aim of this step is thus to develop a set of 3–6 consistent, distant, and heterogeneous strategies.

Step 5: Efficacy evaluation. Through developing a set of scenarios and a set of alternative strategies, the strategists have already succeeded in overcoming rational bounds that prevent them from breaking out of dominant industry mindsets. However, this is at the expense of exposing them to a complex decision-making space.

To enable identifying an optimal strategy, the decision-making is broken down into two steps: first, the efficacy evaluation (Step 5), and then, the robustness evaluation (Step 6). In the efficacy evaluation, the strategists are asked to evaluate to what extent the strategy supports the different goals defined in step 1. This step uncovers typically important trade-offs. For example, one strategy may boost revenues at the expense of profitability, while another one scores high on cash flow but low on revenue and profitability. This efficacy rating is then aggregated into an index that can be plotted on an axis. This technique works with any type of scale. To create a meaningful index, the scores of the individual criteria are, just as in MCDA approaches, multiplied with the weighting factors and summated (Driouchi et al., 2009).

In group-based processes, we experienced that subjective evaluations using ordinal scales tended to be more accurate (ratings have to be 'defended'), and the related discussion increased the participants' knowledge about the precise nature of the options.

Step 6: Robustness evaluation. In this step, the strategists assess the robustness of the proposed strategies under the different scenarios, often using an ordinal scale such as highly robust (scenario supports strategy), robust, neutral, potentially fragile, and highly fragile. In this first step of the evaluation, the strategists ask the question: Which strategy is best/worst adapted to a given scenario? Criteria for evaluation can be feasibility, suitability, and acceptability in a given scenario (Stewart et al., 2013). In the second step of the evaluation, the robustness score is consolidated for one strategy across all scenarios. One way of consolidating is simply by calculating the arithmetic mean. This is, however, often not advisable, as it can be misleading in the case of outliers. We therefore recommend plotting the ratings on a diagram and consolidating the robustness score through discussion (see Fig. 4).

The illustrative example in Fig. 4 shows that Strategy 1 is only a good match with Scenario 1 but highly unsuitable in Scenarios 2 and 3, giving it (after discussion) a robustness score of 'highly fragile'. In contrast, Strategy 3 is not particularly suitable in any of the three scenarios but receives at worst a 'neutral' rating, making it, overall, a robust strategy.

Step 7: Parmenides Matrix. Once both evaluations have been carried out, the results are plotted on the Parmenides Matrix (see Fig. 5), with scenario robustness on the x-axis and goal-based efficacy on the y-axis.

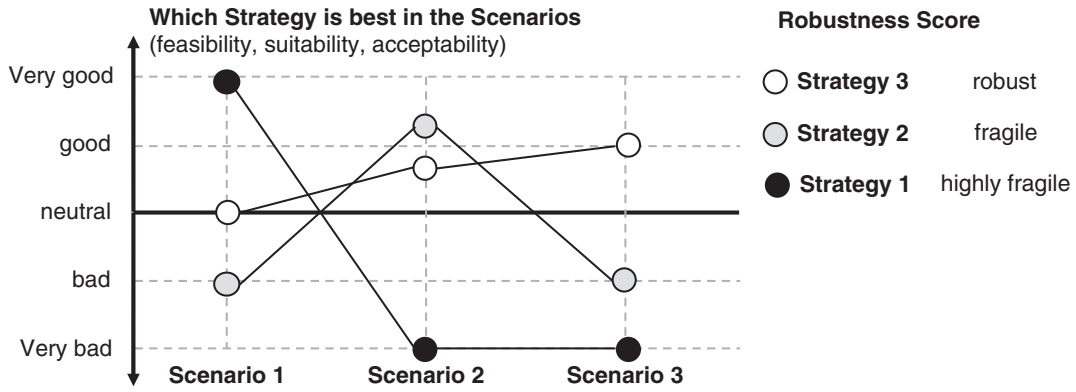

Fig. 4. Robustness profile of four different strategies.

In the upper right quadrant, we find strategies that are both capable of strongly supporting the objectives and robust in different scenarios. The strategies in the upper left quadrant are effective but depend on one or a few favourable scenarios. A decision for one of those should always be accompanied by close scenario-monitoring to be able to switch to an alternative strategy in a timely manner. In the absence of world-class strategies, the trade-off between the more effective (upper left quadrant) and the less effective (lower right quadrant) will be based on the decision makers' risk/reward preferences. The Parmenides Matrix also offers a platform for the strategists to have an informed discussion about trade-offs and preferences to further inform the final decision. Questions can include the following:

- How vulnerable is the most effective (goal-oriented) strategy?
- How effective is the least scenario-dependent (most robust) strategy?
- How effective are my strategies in a specific (maybe most probable) future scenario?

The Parmenides Matrix is the basis for identifying the optimal strategy. Plotting the analysis in a matrix enables the strategists to have a deeper level of discussion in which, frequently, assumptions about the risk preference of the organisation and the relative importance of objectives are challenged. It also permits a deeper validation of the analysis and, if necessary, altering the scores. We can thus expect that the usage of the Parmenides Matrix can boost both ease of judgement and transparency.

4. Application cases

In the following sections, we will discuss two cases in which the Parmenides Matrix approach has been applied. In both cases, we collected feedback on its benefits vis-à-vis the traditional decision-making approaches. We use a cross-case analysis to reflect on the ability of the approach to reduce the three bounds associated with the behavioural failures of organisations, which we described in the introduction (Gavetti, 2012).

4.1. German environmental ministry

Our first case is the German Environmental Ministry. The aim of the scenario-based strategizing project was to develop new strategies for updating the German Resources Efficiency Programme (ProgRess) to ProgRess II. Such a political process has several stages. In this case, UBA (serving as an interface between science and policy, providing scientific background for political argumentation for the German Environmental Ministry) provided the draft text, which was then adapted by the Ministry and forwarded to the cabinet with a series of adjustments. Ultimately, the cabinet made the decision on the final text after

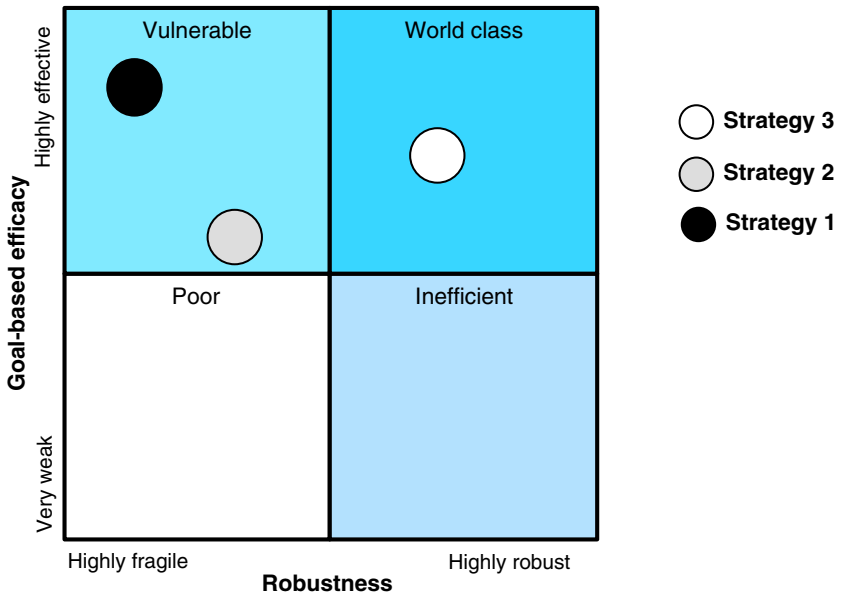

Fig. 5. Parmenides Matrix - plot of the final results.

negotiation between concerned ministries.

Throughout the whole process, stakeholders (e.g. representatives from other ministries, industrial associations, and environmental NGOs) tried to influence the process. Early involvement and exchange with stakeholders could be a typical win-win solution for ministries and NGOs (integration of positions, 'buy-in'). Therefore, the project aimed at integrating stakeholders and creating a 'safe space' to discuss throughout the entire legislation process.

Based on preliminary assessments of global megatrends, a more comprehensive 'scanning' was performed to further analyse the external driving factors of the resource efficiency program (Lorenz and Haraldsson, 2014). Five scenarios were developed in a participatory process following the above-mentioned Steps 1 to 3. The scenario-building team consisted of 20 experts from NGOs and ministries.

In the next step (4), five strategies were developed. One challenge in this case was that the outcome should help to further develop an already existing program. Hence, it was difficult to introduce a different mode of thinking by offering the space to develop multiple options'. Nevertheless, ex-post feedback from participants, especially from NGOs, was highly positive as '*outlying viewpoints had seriously been discussed and assessed during the creation of the strategies*'.

Due to the complex political setting of the project and the usual difficulties regarding the definition of an actor perspective (possibly a ministry, a market and its actors, or society), an evaluation of policy approaches against objectives was not part of the process. Instead, this was done by an expert group. Both assessments were conducted as described in Steps 5 and 6. The final assessment of the strategies' robustness varied highly across scenarios, which was reported to be '*very interesting*' by a high-level representative of the Ministry, especially in light of the political process.

A typical project that informs the legislative process would communicate the results of the analysis through one clear recommendation, potentially with a few options/variants. In our case, the presentation of the Parmenides Matrix facilitated a more balanced discussion of alternative strategies along the two dimensions, robustness and goal-based efficacy. In addition, the matrix was used to visualise the divergent scores from the different stakeholder groups (science community, politicians, and industry representatives). This triggered an additional beneficial discussion that '*boosted the analysis and intensified the feeling of ownership of the results among the participants*'. The approach and, in particular, the matrix were seen as an '*important catalyst for the subsequent policymaking process*' and particularly '*potent for broadening the solution search scope*', suggesting a positive impact on the reduction of the rationality bound.

Applying the Parmenides approach in such a complex political setting also revealed challenges. One issue was the lack of a precise actor perspective, which complicated creating the buy-in of all participants. In addition, the evaluation of policy approaches against the objectives was done by the expert group, which inhibited a smooth adoption of the results by the decision makers. In other words, the process was mostly driven by the planners and not the strategists.

A further advantage, however, was that the cognitive demanding assessments drew participants' attention away from thinking about how to optimise their own position through influencing the outcome of the process (i.e. promoting vested self-interest). We hence attest that the process, in this case, has an ability to create its own gravity that draws the participants towards creating a joint and more balanced solution for a common problem. This is promising as alternative approaches typically work more as a platform for sequentially discussing the individual priorities, identifying congruent interests, and finding compromises for the divergent interests. If the approach can also, in other contexts, show this ability to facilitate more collaborative strategizing, it would be promising for overcoming the plasticity bound.

As for the shaping-ability bound, we cannot make final conclusions in this case because many of the implications for the analysis are subject to consultation before the final policy is approved. However, the shared deep insights into scenarios and strategies can be expected to boost the likelihood that meaningful actions are triggered.

4.2. Bosch

Our second case took place in a for-profit organisation. Bosch is a leading supplier of technologies and solutions for mobility, industrial, energy-building, and home appliances. Bosch is affected, like the respective industries, by disruptive trends such as autonomous driving, 3D printing, and Industry 4.0, as well as new business models and competitors.

The Parmenides Matrix approach was applied in the yearly 'strategic dialogue' between the corporate level and the business units. The aim of this dialogue is primarily the identification of novel strategic focus topics, which can include new target business fields or strategies responding to competitors' challenges.

The Parmenides Matrix was applied independently in three different business units in two European countries, giving us a portfolio of applications for in-case comparison. In the first application, the format of the project was a 'war-gaming exercise' to analyse future competitive environments and evaluate possible strategic positions. In the second application, the approach was used to challenge a recently defined and well-performing new strategy against possible future disruptions (wind tunnelling). In the third application, a dynamic visualisation of the Parmenides Matrix was developed to analyse the efficacy and robustness of different strategic options over time. Participants in all three cases were members of the board, from business unit management and corporate strategy, as well as individual experts.

In the first application, 'competitor-attack' scenarios were developed, which not only allowed for an evaluation of different strategies' robustness in the Parmenides Matrix approach, but also served as a tool for mapping the vast amount of (real and potential) competitors. Based on an indicator system developed for the different scenarios, the business units were able to continuously track the robustness of the current strategy and received predefined strategy elements that they could use if the environment shifted towards an alternative scenario. The major benefit of the second application was reported to be the broadening of the horizon from a technology focus to a broader (market-driven) perspective, also including a market outlook. The approach helped to avoid overconfidence through systematically challenging the current strategy's assumptions and continuously searching for 'white spots'. In the third application, the approach helped to challenge the currently successful strategy by systematically running through options for strategic positioning of the business unit's product portfolio. The scenarios were thus used to reposition a business that is competing in a saturated market.

On a general level, the applications at Bosch were praised as an effective answer to the challenges strategizing teams are facing today:

- *Creating a platform for collaborative strategizing*. The joint development, discussion, and visualisation helped to increase the clarity of the elements of the decision process (objectives, drivers, options, strategies, and scenarios). This resulted in well-understood decisions, in alignment towards a common overall picture, and a deep understanding of the assumptions underlying the alternative strategies.
- *Creating shared ownership of strategic options*. Jointly discussing and altering alternative strategies and scenarios helped the mixed teams to transparently discuss (scenario-specific) options, deviations, and assumptions by breaking up the overall complexity into smaller elements.
- *Raised efficiency*. The approach was said to have increased the speed and flexibility of decision-making. A regional president reported that due to the '*increased quality of the discussions, time-consuming evasions could be avoided and as a result, the speed of decision-making increased*'.

- *Embracing uncertainty while keeping the approach manageable*. While the effort and the related knowledge generation required working with a complex matrix, the participants felt that the approach was a well-invested cognitive effort, particularly when compared with traditional methods employed in the strategy dialogue. Effort for updating than traditional methods and hence can be expected to increase the company's strategic agility. The approach has been evaluated as a '*highly efficient framework*' by the executive management.
- *Continuous strategizing instead of closing the strategic dialogue*. Another comment was that the Parmenides Matrix, at first, felt uncomfortable as it seemed to fail to propose a clear 'optimal strategy'. Ultimately, however, the participants felt that the dynamic framework was a good platform to decide on a course of action for the near future while staying available for continuous strategizing and for facilitating organisational learning.
- An additional comment was that the approach *helped to anticipate strategic issues*. That was seen in contrast to early approaches that failed to ensure that the strategists saw '*a decision coming up*'. In addition, the approach was reported to facilitate reaching clarity and congruence among the strategist team by seeing a '*big picture evolve*'.

4.3. Impact of the Parmenides Matrix approach

We set out with the proposition that scenario-based strategizing can be expected to have a positive impact on overcoming the three cognitive bounds (rationality, plasticity, shaping-ability) known in behavioural strategy (Gavetti, 2012). To test this proposition, we built on our process observations and interviews with participants. Observations and interviews were first coded deductively, where we looked for evidence that cognitive bounds were positively affected, i.e. we had quotes or made observations that suggested that a particular part of the Parmenides Matrix approach did contribute to overcoming the three cognitive bounds. Following the Gioia methodology, we engaged in a second analysis where we coded inductively, looking for patterns that could explain why a certain step/method/tool contributed to overcoming a cognitive bound (Gioia et al., 2012). The result of our analysis is shown in Table 1.

In the public sector case, stakeholders reported having developed a '*more comprehensive perspective on the overall issue*'. In both cases, the identification of endogenous and exogenous change drivers was supported by the use of frameworks such as PESTLE or SWOT. Additionally, external experts were used to maximise heterogeneity and broaden the scan for change drivers. Overall, the systematic and modular approach gave the participants an impression of '*not having forgotten anything*'. This led us to conclude that the frameworks raise the comprehensiveness of the portfolio of change drivers. In addition, the shaping-ability bound can be weakened as the confidence that the analysis rests on a comprehensive appraisal of all change drivers can be expected to raise the legitimacy of the final strategy recommendation.

In the Bosch case, the strategists commented that the approach helped in '*dragging [them] out of the comfort zone*', which suggests an impact of broadening the strategic solution space. Our approach utilizes two primary tools to enable mental leaps. The general morphological analysis ensures that options are not directly ruled out because they are, in the view of participants, not feasible/desirable/suitable. It forces participants to define options first and hence disconnects the option development from the judgement. The scenario analysis, for which we used, in both cases, a computer-aided consistency analysis, reinforces this disassociation of analysis and outcome. The comment that this enabled '*out-of-the-box thinking*' is a promising sign that the approach contributes to overcoming the plasticity bound. The quote about the popularity of a previously dismissed scenario reinforces this impact expectation and the expectation that the methods contribute to overcoming established mental models.

Another design element of the approach is to break down the overall strategizing process into smaller cognition steps. This was said to result in a '*more relaxed interpretation/alignment of sometimes alarming current daily business events*', or, in other words, the ability of the process to refocus the participants' attention from promoting vested interests into considering long-term optimization by going systematically through the analysis steps. In the governmental organisation case, it was also seen as a way to democratise strategizing: Steps 5 and 6 worked as a '*facilitator for the exchange of interest and thus form a vital element of a democratic policymaking process*'. This gives rise to the hope that breaking down the strategizing process into cognition steps can reduce the plasticity and shaping-ability bounds. The approach should be

Table 1
Evidence of the impact of the Parmenides Matrix approach.

Quotes/observations	Impact	Method/tool	Affected bound		
			R	P	SA
• "More comprehensive perspective on the overall issue" • "Impression of not having forgotten anything"	Broadening perspective, ensuring comprehensiveness	Modular approach, PESTLE, SWOT framework	✓		
• Involvement of heterogeneous group of experts					✓
• "Thinking outside the box" • "Dragging out of the comfort zone"	Enabling mental leaps (cognitive search)	Morphological analysis		✓	
• "I was surprised by the popularity [in terms of desirability] of a specific scenario that wasn't amongst the ones seriously considered earlier"		Scenario analysis			
• "More relaxed interpretation/alignment of sometimes alarming current daily business events" • Steps 5 and 6 as a "facilitator for the exchange of interest and thus form a vital element of a democratic policy making process" • "It's way more than the naked process; it's about fully immersing into the issue in all its dimensions"	Emphasizing analysis (reducing behaviour of promoting vested interests)	Decomposing of the strategizing process into distinct cognition steps		✓	✓
• "The final decision always depends on the full picture arising in my mind; this picture has never been so visible"	Raising tangibility of options and trade-offs	Parmenides Matrix			✓
• "Flexibility of discussing options, deviations and considerations based on the presented approach" • "Finally, I'm in possession of a strategic game board allowing for a simultaneous consideration of all necessary elements and thus challenging pre-existing pictures, views and beliefs"	Enabling open, strategic discussion, synthesis, and strategic monitoring	Parmenides Matrix		✓	✓
• "We didn't even need the calculations; the common picture in our minds was the important result" • "I simply couldn't have decided otherwise"	Raising confidence in final decision	Parmenides Matrix			✓

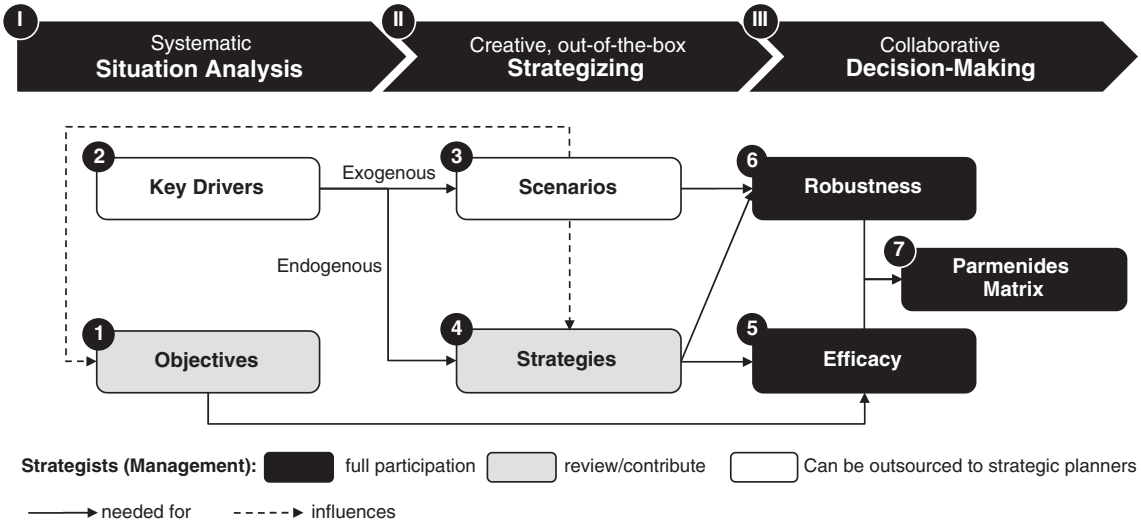

Fig. 6. Top management (strategists) participation.

particularly impactful if participation is sufficiently engaging.

While the methods and tools discussed up to this point have been used earlier, we were particularly keen on observing the impact from the Parmenides Matrix visualisation. In the Bosch case, one manager claimed that '*the final decision always depends on the full picture arising in my mind; this picture has never been so visible*'. We translate this to a high level of tangibility that permits an increase in the feeling of ownership and control over the different options and trade-offs. In other words, the matrix provides a connection between the strategists and the strategy, similar to the connection between a pilot and his flight plan. If that effect can be triggered regularly, it can be expected to boost the shaping ability.

Even more important for us was the question of whether the approach enables creative strategizing and the forming of a synthesis to finally provide the firm with a superior course of action, as advocated by Henry Mintzberg (Mintzberg, 1994a). The first positive sign in that regard was the observation of one strategist that the approach provided '*flexibility of discussing options, deviations and considerations*', highlighting the ability of the strategizing team to openly explore different options. The regional president of one business unit added, '*Finally I'm in possession of a strategic game board allowing for a simultaneous consideration of all necessary elements and thus challenging pre-existing pictures, views and beliefs*', which underlines the ability to form strategy and provides the opportunity to develop strategic options that are markedly different from the status quo.

The final threshold for overcoming the shaping-ability bound is, however, that sufficient confidence is built. This is particularly relevant if a strategy will be adopted that is distant to the current one. Here, it was particularly interesting that one participant, compared with earlier intensive mathematical modelling exercises, noted, '*We didn't even need the calculations; the common picture in our minds was the important result*'. This suggests that the tangibility of the mapping in the matrix can (to a certain extent) substitute the number-crunching exercises associated with strategic planning in a relatively stable environment. In stable environments, business-case calculations or comparisons of net present values define the optimal strategy. In uncertain environments, however, they are typically not conclusive, as they are built on too many assumptions. Hence, it is particularly promising that the systematic qualitative assessment seems to reach a sufficient level of confidence to allow a final decision. In the Bosch case, the regional president of one business unit said, '*I simply couldn't have decided otherwise!*', underlining that in uncertain environments, the Parmenides Matrix successfully builds confidence.

Our cases and the impact analysis let us tentatively conclude that the approach as a whole and the Parmenides Matrix in particular have a positive impact on overcoming the three cognitive bounds that are responsible for the inability of organisations to drive renewal processes. Furthermore, we were able to link individual elements of the process (methods, tools, and approach characteristics) to the positive impacts. That would also permit informing the customization of scenario-based strategizing approaches for different organisational environments.

4.4. Participation of top management

One particularly important choice in the approach design is when and how top management, or, in our definition, the strategists, should participate in the strategizing process. Generally, we can expect that the more top management participates, the higher the potential buy-in and the higher the likelihood that the new course of action is legitimized and enacted. However, in practice, full participation will stay rare, as upper-echelon attention is scarce and delegation in strategic planning is the norm. Hence, the question becomes how much delegation is possible and what trade-offs need to be considered. We expect that there is not one best way, but in Fig. 6, we have highlighted the steps that have been said to be particularly crucial for the strategizing team to participate in.

We distinguish three levels. The first level consists of steps that can be outsourced to strategic planners. Scanning for key drivers could be one of those activities, as could the development of the scenarios. While it is better if top management participates or at least contributes, strategists often feel comfortable receiving the scenario overview and engaging in the strategic discussions. The second level is review and contribution. That typically involves activities such as assessing, rating, voting, and commenting on intermediate results. The steps that fall into this level and thus can be driven by planners and only reviewed by the strategists are objectives development (Step 1) and the development of strategy alternatives (Step 4). The assessment of robustness (Step 6) and of the goal-based efficacy (Step 5) has to be performed by the strategists to ensure a sufficient level of strategic discourse. The ownership of the strategic recommendations will only be sufficiently developed if a deep strategic discussion is facilitated through the approach. That will also open up the opportunity for the strategists to actively move (i.e. reassess) strategies in the Parmenides Matrix after its first mapping.

5. Discussion

In our article, we have introduced a novel scenario-based strategizing approach and reported on its application in two different

contexts, in a for-profit organisation with a corporate structure and in a governmental agency. This allowed us to assess the applicability and impact in different environments. Future research could apply the approach, or variants of it, in other contexts, altering, in particular, the environmental uncertainty and the external pressure on the strategizing teams. This should provide deeper insights into its impact in different environments and on customization need.

In terms of the technical dimension of the approach, there are potential weaknesses that should attract detailed scrutiny. First, the reduction of the framing bias due to separation of the two evaluation procedures (robustness and efficacy) and the juxtaposition of the two decisional dimensions in the Parmenides Matrix have merits but might also carry important downsides that should be investigated further. Second, the systemic identification of key drivers cannot fully eliminate the IL deficit of narrowing perspectives due to an overemphasis on 'efficient causes'. Derbyshire and Wright's (2017) proposal based on a typology of causes offers a promising remedy in this regard (Rohrbeck and Schwarz, 2013).

Based on the feedback of the participants, the positive effects of software-supported visualisations in inter-organisational strategizing teams (performance, satisfaction) shown by Comi and Epler (2011) have been generally confirmed. However, there are also limitations. Öllinger et al. (2015), for instance, were able to demonstrate that successful representation of the causal structure and the control of a complex scenarios require the concerted interplay of cognitive skills that go beyond drawing causal maps. Bresciani and Eppler (2015) systemically identified and categorised potential pitfalls of visualisation as a starting point for further research on visualisation risks. Graphical information presentation in negotiation situations has shown to yield behaviour and strategy choices that differ from table representations of the same information (Gettinger et al., 2012). It will be important to empirically validate the usefulness and potential downsides of visualisations during the different steps of the process.

6. Conclusion

With this paper, we aim to contribute to our understanding of how the usage and usability of scenario-based strategizing can be enhanced. We presented a novel process that we call the Parmenides Matrix approach and discussed its application in two cases. We used a two-level yardstick in which we used the quality criteria for decision-making put forward by Goodwin and Wright (2001) to inform the design of the approach. We then applied the cognitive bounds known in behavioural strategy to measure its impact. The case applications indicate that all three (rationality, plasticity and shaping-ability) bounds can be reduced by the approach.

To maximise the positive impact on the three bounds, we also provide advice on where in the process and to what extent top management should participate. We conclude that top management can outsource some of the scenario-based strategizing steps to strategic planners but that they should drive the three final steps, i.e. the assessment of robustness, goal-based efficacy, and the decision-making based on the Parmenides Matrix. In other steps, the development of the strategic alternatives and the development of the strategic objectives, a reviewer role could be sufficient. Planners can, in addition, take over most of the work on the identification of the key drivers and the scenario development. Ideally, the identification of key drivers would be an ongoing strategic foresight activity to ensure sufficient depth. It could be implemented, for example, through ongoing scanning and monitoring of key drivers (Rohrbeck, 2006; Rohrbeck, 2010).

The main promise that scenario-based strategizing holds is raising the likelihood that strategists can form and execute strategies that are distant from the status quo and yield a higher value-creation potential (Gavetti and Menon, 2016; Rohrbeck and Schwarz, 2013; Rohrbeck, 2012). In our cases, we observed promising signs that mental models were challenged and the openness to consider more distant alternatives was increased. The evidence is, however, not conclusive, and further research should apply pre- and post-measurements to determine the change induced by the scenario-based strategizing.

Furthermore, it will be important to ask how our approach can be integrated into a wider framework that promotes organisational learning, particularly in fast-moving industries. Other methods such as actor analysis, Delphi analysis, and multi-criteria evaluation could be added (Bradfield et al., 2005). It might also be necessary to modify the process, adding further steps (e.g. stakeholder analysis, benchmarking exercises, and technology roadmapping), such as those proposed by Heger and Rohrbeck (2012). Scenario-based strategizing could also be particularly relevant for innovation networks consisting of public and private organisations that create new value chains and business models (Heger and Boman, 2015; Rohrbeck et al., 2013). In other cases, the sequence might need to be changed (e.g. reassessing of objectives and updating of key driver analysis after scenario development).

The difficulty in defining the actor perspective, identified in the governmental case, points to a fundamental difference between decision-making in the for-profit and governmental spaces. In a firm, even a large corporation, it is possible to take a clear actor's perspective and define the related objectives to be pursued. Policymaking, however, follows the principle of balancing the interests of a large number of its stakeholders. In consequence, the application of our approach may need to be further adapted to public contexts.

For the ability of the approach to boost strategic agility, the feedback from Bosch is particularly promising. The participants highlighted the increase in speed of decision-making once the framework was established. This speed also enables more frequent updating of courses of action, which should enable moving towards real-time strategic decision-making, which was already predicted as a next step in strategic issue management in the 1980s (Ansoff, 1980). This seems to be particularly crucial in today's complex and volatile environments. It would also allow adapting strategy implementation to uncertain environments. Here, real options can become a powerful tool to define and manage a portfolio of small investments in order to retain the right to play in future markets (Favato and Vecchiato, 2016).

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