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Quantifiying blind spots and weak signals in executive judgment: A structured integration of expert judgment into the scenario development process

Philip Meissner *, Christian Brands, Torsten Wulf

Philipps-University Marburg, Chair of Strategic and International Management, Universitätsstr. 24, 35037 Marburg, Germany

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ABSTRACT

The integration of expert judgment is a fundamental pillar of most scenario planning processes. In particular, the systematic scanning of external expert opinions has been shown to be effective for the early detection of emerging threats and opportunities in an organization's environment. However, organizations tend to focus on internal advice more than on advice from external experts. This can be critical for organizations if it leads to an inertia in internal judgment, resulting in blind spots or a failure to see weak signals in the firm's periphery. In this article, we introduce a structured framework for the collection and structuring of internal and external expert judgment. This so-called 360° Stakeholder Feedback tool provides a structured and quantitative approach for the detection and discussion of blind spots and weak signals in scenario planning processes. Thus, it can contribute to a better and more holistic judgment in the strategic process. We demonstrate the methodology based on a case from the German construction industry, in which we aggregate and analyze expert judgments from different stakeholder groups regarding the future of the industry.

1. Introduction

Expert judgment is a crucial determinant of most scenario planning processes (Bolger & Wright, 1994; Bradfield, Wright, Burt, Cairns, & Van Der Heijden, 2005; Jungermann & Thüring, 1987). However, eliciting and structuring this input to the scenario planning process is challenging, and is often subject to biased judgement (Bradfield et al., 2005; Meissner & Wulf, 2013; Schoemaker, 2004; Wack, 1985). Thus, decision makers often misperceive or misinterpret changes in the firm's periphery. Such misinterpretations in judgment are called blind spots (Zajac & Bazerman, 1991), while misperceptions of seemingly random and unconnected information at the periphery are known as weak signals (Schoemaker & Day, 2009). Both can impair judgment and reduce the quality of the strategic decisions obtained as part of the scenario process (Hodgkinson, Bown, Maule, Glaister, & Pearman, 1999; Schoemaker, Day, & Snyder, 2013).

Research on the elicitation of expert knowledge suggests that, when integrating and aggregating expert judgment, quantitative methods in particular can be used effectively to support the decision making and planning processes (Meyer & Booker, 1991; Morgan, 2014; Morgan & Henrion, 1990). This quantification of expert judgment regarding developments and the associated uncertainty has been linked to the reduction of group think or similar group biases resulting from dominant participants in group discussions (Aspinall, 2010).

* Corresponding author. Tel.: +49 6421 28 22845; fax: +49 6421 28 22843.
E-mail address: philip.meissner@uni-marburg.de (P. Meissner).

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In the context of scenario planning, a variety of different tools, such as the Delphi analysis (Bolger & Rowe, 2014), are used to quantify and structure expert judgment (Soste et al., 2015; Warth, von der Gracht, & Darkow, 2013). However, it still remains difficult for organizations to analyze the judgments of internal and external experts systematically, as these groups often evaluate environmental change differently (Bonaccio & Dalal, 2006). In particular, an analysis of the resulting weak signals and blind spots is an issue that has not been discussed previously in most of the literature on scenario planning and expert knowledge elicitation.

In this paper, we describe an approach for quantifying blindspots and weak signals in the strategic planning and scenario development processes. This so-called 360° Stakeholder Feedback is a technique that structures expert judgment from multiple internal and external stakeholder groups and allows for a quantitative comparison of their evaluations.

This paper contributes to the literature on scenario planning and the elicitation of expert knowledge by introducing a technique that combines the different perspectives that are inherent in the discussion of the comprehensive elicitation and structuring of expert judgment. It builds upon stakeholder-oriented logic (Warth et al., 2013) to detect unconscious blind spots and weak signals in the strategy process. Ultimately, we suggest that this approach can assist in making a more effective use of executives' judgment in decision making processes by increasing the debate and cognitive conflict in the management team based on a discussion of the blind spots and weak signals highlighted by the analysis.

2. Expert judgment in scenario planning

The scenario planning method has been described widely in the literature (e.g. Schoemaker, 1995; Schwenker & Wulf, 2013). The most widely used and analyzed technique for scenario development is the so-called intuitive logics approach, which develops scenarios based on important driving forces that are aggregated in the two-by-two matrix used to derive the scenarios (Schwartz, 1996; Van der Heijden, Bradfield, Cairns, & Wright, 2002). Recently, a wide range of different methodologies, such as the antifragile methodology (Derbyshire & Wright, 2014), backcasting (Dreborg, 1996) and the backwards logic approach (Wright & Goodwin, 2009), have been introduced in the literature in order to overcome the limitations that are inherent in the intuitive logics approach (Goodwin & Wright, 2010; Wright, Bradfield, & Cairns, 2013). While these approaches are all based on distinct designs and approaches, they share the common goals of developing more flexible strategies that will allow organizations to counteract uncertainty (Schoemaker, 1995), and ultimately improving the quality of strategic decisions in organizations (Meissner & Wulf, 2013; Schwenker & Wulf, 2013).

Scenario planning processes in organizations rely strongly upon input and judgment from experts (Goodwin & Wright, 2010). Thus, the comprehensive elicitation and structuring of expert judgment can help to avoid biased evaluations and inertia in the process (Kahneman & Lovallo, 1993; Tripsas & Gavetti, 2000). In contrast, a failure to integrate such advice properly can lead to blind spots and weak signals that can reduce the quality of the planning process (Chermack, 2004; Schoemaker, 1993; Schoemaker et al., 2013).

Prior research analyzing expert judgment has shown that quantitative ways of aggregating expert opinions can be very effective for the elicitation of expert knowledge as a part of scenario planning processes (Aspinall, 2010; Morgan & Henrion, 1990; Rowe & Wright, 1999, 2011). While this research has suggested various different methods for the quantitative and more complete integration of uncertainty and probability estimates from different experts (Bolger & Rowe, 2014; Morgan, 2014), it has not yet determined how such a quantitative elicitation can be used to detect or counteract weak signals and blind spots.

Research from the domain of scenario planning suggests that the quality and extent of expert judgment is crucial for the identification of potential blind spots and weak signals (Hodgkinson et al., 1999; Schoemaker et al., 2013). In particular, external experts have been shown to have a positive influence on scenario processes by fostering debate and cognitive conflict in the management team (Goodwin & Wright, 2010), as well as by reducing cognitive biases (Meissner & Wulf, 2014). Thus, a combination of quantitative approaches that elicit both internal and external expert judgment could be used effectively to analyse blind spots and weak signals in scenario planning.

2.1. Techniques for eliciting and structuring expert judgment in scenario planning

Various different methods for the elicitation and structuring of expert judgment in the context of scenario planning have been introduced. The most important of these techniques are the Delphi method (Nowack, Endrikat, & Guenther, 2011; Von Der Gracht, 2012), the Q2 technique (Varho & Tapio, 2013), and the Strategic Radar (Schoemaker et al., 2013).

The Delphi method is one of the most frequently used techniques for aggregating expert judgment as part of the scenario method (Warth et al., 2013). It aims to access the positive aspects of group interaction, such as the aggregation of knowledge from a diverse set of sources, while overcoming some of its negative features, like group think or personal conflict (Rowe & Wright, 1999). Over time, many different variations of the method have emerged (for an overview, see Rowe & Wright, 2011) that have been linked to improvements in judgment for the forecasting and decision making processes (Rowe & Wright, 1999; Von Der Gracht, 2012). Consequently, the Delphi technique has emerged as an important and helpful tool for integrating quantitative expert judgment into the scenario planning process. However, as far as we are aware, it has not yet been used specifically for identifying and quantifying blind spots and weak signals (for an overview and comparison of the respective methods, see Table 1).

The Q2 technique integrates and aggregates quantitative Delphi data and combines it with insights generated from expert interviews. This input is then examined using

Table 1
Techniques for eliciting and structuring expert judgment in scenario planning.

	Quantification of expert judgment	Analysis of weak signals	Analysis of blind spots
Delphi method	+	–	–
Q2 technique	+	–	–
Strategy radar	+	+	–
360° stakeholder feedback	+	+	+

cluster analysis and combined in futures tables (for a detailed description of the process, see Varho & Tapio, 2013). Like the Delphi method, this approach presents a comprehensive multi-method approach for the integration of expert judgment that can be used to quantify potential future developments very effectively. However, the application of this method can often be very time consuming (Varho & Tapio, 2013). In addition, it does not allow specifically for the analysis of blind spots and weak signals.

The third method which is applied frequently for aggregating expert judgment in scenario planning processes is the so-called Strategic Radar. Its goal is to enable corporations to make a proactive strategic response in the case of abrupt changes in the environment (for a detailed description of the method, see Schoemaker et al., 2013). Its monitoring and analysis are based on a combination of tools and methodologies for scanning the environment and aggregating data in order to provide a diverse and comprehensive set of inputs that allow for the analysis of weak signals. The resulting weak signals are aggregated further, and finally included in the scenario development process. While the Strategy Radar allows for the quantification of expert judgment as well as the analysis of weak signals, the method does not provide a quantitative comparison of the evaluations of internal and external experts in the process, in order to analyze potential blind spots.

Despite the methodological advances that have been made in the integration of expert judgment into the scenario planning process, it remains difficult for organizations to analyze and aggregate the judgments of internal and external experts in the scenario process systematically in order to analyze weak signals and blind spots in the process. While all of the methods analyzed allow for a quantification of expert judgment that structures their knowledge, only the Strategy Radar provides a technique for detecting weak signals. Blind spots cannot be analyzed by any of the approaches studied.

In the next section, we present our approach to the identification of blind spots and weak signals through the structuring and aggregation of expert judgment from multiple internal and external stakeholder groups that allows for a quantitative comparison of their evaluations (see Table 1). The details of this so-called 360° Stakeholder Feedback technique, together with a real-life example of its application to the German construction industry, are described below.

3. Overview of the 360° stakeholder feedback technique

The overall aim of the 360° Stakeholder Feedback technique is to include expert judgment in a comprehensive

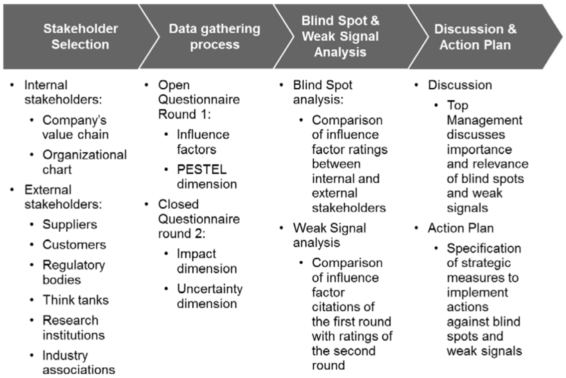

Fig. 1. Four-step process of the 360° Stakeholder Feedback.

overview of the factors that influence an organization's future performance (Schwenker & Wulf, 2013). By following a four-step process (see Fig. 1), the technique allows the inclusion of multiple viewpoints at both a qualitative and a quantitative level, ensuring that blind spots and weak signals are detected and quantified in a systematic manner. The four steps are stakeholder selection, the data gathering process, the analysis of blind spots and weak signals, and finally the discussion and action plan.

3.1. Stakeholder selection

The first step of the technique selects a variety of both external and internal stakeholders to take part in the process. The purpose of the stakeholder selection is to scan the internal and external environments for experts with different perspectives on factors that may influence the future development of the organization. Finding internal experts within large corporations and convincing them to share information is a critical task, since insights often remain within a single business unit (Dyer & Nobeoka, 2000; Schoemaker et al., 2013). Therefore, when selecting internal stakeholders, we suggest that both an organization's value chain and its organizational chart be examined, looking for individuals at a strategic level who can assess the future development of the organization's industry. These individuals should have a broad industry knowledge, being aware of the internal and external influence factors that shape the future development of an industry. Ideally, an expert will hold a management position, at a senior vice president level or above. In addition, experts should be in a position to make strategic decisions, rather than just running an organization operationally. For example, if one wants

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to apply the 360° Stakeholder Feedback to the global premium automotive industry, the head of product development at BMW would be a good internal participant with strategic knowledge of the automotive industry. It is generally sufficient to select one or two experts per value-chain level. This approach ensures that each important step of an organization's value-creation process can state its opinion on the future of the appropriate industry.

When selecting external stakeholders, we suggest the selection of external opinion leaders who are knowledgeable about the organization and its environment from different, external perspectives. As Schoemaker et al. (2013) point out, these experts expand an organization's field of vision by extending its social boundaries. These external stakeholders can include individuals representing suppliers, customers, regulatory bodies, think tanks, research institutions or industry associations, for example. Returning to our example of applying the 360° Stakeholder Feedback to the global premium automotive industry, the head of the U.S. National Highway Traffic Safety Administration would be a good external expert for assessing factors that may be influential in shaping the future industry from a regulatory perspective. It is sufficient to select one or two experts per organization. In total, the list of internal and external stakeholders should comprise between forty and fifty experts. Once this list is complete, the second step of the 360° Stakeholder Feedback technique, the data gathering process, can start.

3.2. Data gathering process

The data gathering process consists of a two-step survey to be conducted with the identified stakeholders either online or offline. In the first survey, each of the stakeholders is asked openly about factors that might influence the future development of the organization. The collection of the influential factors is structured along the PESTEL (political, economic, social, technological, ecological and legal) dimensions, ensuring a comprehensive and holistic consideration of influential factors from all areas that are relevant to the external environment of an organization (Hodgkinson, Whittington, Johnson, & Schwarz, 2006). This step generally yields about 300 to 400 different factors. Once all of the participants have completed the first step of the survey and returned their list of influential factors, the project leader can start the synthesis and clustering of the factors collected. Most of these factors have similar meanings, and are therefore named several times by different internal and external experts. As part of the clustering process step, a content analysis is used to reduce the number of factors (Furrer, Thomas, & Goussevkaia, 2008). By screening the factors for semantic communalities, similar factors are grouped in a single list. Going back to the previous example of applying the 360° Stakeholder Feedback to the global premium automotive industry, similar factors could include "the introduction of a road toll on all freeways in the US", "the introduction of a road tax for all passenger cars" or "the introduction of a pay-per-mile-fee on interstates for cars", for example. These factors can be summarized in a single factor such as "the introduction of a nationwide road toll for cars", which is then used in the second round of the questionnaire. Our experience has shown that between 70% and 80% of the factors named in the first round are semantically similar, and can typically be synthesized and grouped to give around forty factors for the second step of the survey. Usually, there are a few factors with surprising or unforeseen future developments that are named by only a handful of participants. These few factors can be included in the second-round questionnaire directly without synthesis. The quality of the factor groupings is ensured by discussing both the synthesis process and its results with a handful of the internal and external experts who took part in the first round of the questionnaire. This is to ensure that no important factors are left out or synthesized wrongly.

The second questionnaire containing the list of influential factors thus identified is then sent to the same participants as in the first round. The synthesized set of factors is presented to the participants and they are asked to rate each of these influential factors according to its impact on the future financial performance of the selected organization, as well as with regard to the uncertainty of the occurrence or the future development of the factor. In each case, this assessment is done on a 10-point Likert scale ranging from one (low/weak) to ten (high/strong).

3.3. Blind spot and weak signal analysis

The data gathering process yields a comprehensive list of factors that might have an impact on the future development of the organization. The impact and uncertainty of these factors have been evaluated by a wide range of internal and external experts with different perspectives. The results of the data collection enable blind spots and weak signals to be analyzed quantitatively. We define quantitative blind spots as a misperception or misinterpretation of changes in the firm's periphery (Hodgkinson et al., 1999; Schoemaker et al., 2013). A blind spot exists if internal experts' ratings of the impact and uncertainty of a given factor are significantly lower than those of external experts. In order for a blind spot to exist, the difference between the internal and external ratings has to be greater than one. Otherwise, we categorize it as a small misperception rather than a blind spot. In the next step, these identified blind spots can be ranked by the greatest differences, and thus importance (see Figs. 2 and 3).

The next issue to focus on as part of the data analysis is the detection of weak signals. We define weak signals as a misperception of seemingly random and unconnected information in the periphery (Schoemaker & Day, 2009). They can be identified as follows. Going back to the results of the first questionnaire, we look for and record influential factors that were named by a maximum of three participants, representing less than 10% of all participants. Then, going to the results of the second round questionnaire, we analyze the ratings of the recorded factors in terms of impact and uncertainty by all questionnaire participants in the second round. If the impact and uncertainty ratings for these factors are high, i.e., above five, we have obtained and quantified a weak signal. The general idea behind this process is that participants might become aware in the second round of a

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factor which they did not consider and mention in the first round. If they find this factor surprising and relevant, they will evaluate its impact and level of uncertainty as being high. Hence, this factor can be considered a weak signal (see Fig. 4).

3.4. Discussion and action plan

In the final step of the 360° Stakeholder Feedback technique, the comprehensive list of influential factors, blind spots and weak signals is presented to and discussed with the top management of the organization. The blind spots and weak signals in particular provide a good starting point for re-evaluating and potentially adjusting existing assumptions and viewpoints that top management might hold on the future development of the organization's environment. As part of this re-evaluation, the top management can certainly arrive at the conclusion that external experts have been wrong in their evaluations of the impact or uncertainty of certain factors. In this case, the respective blind spots and weak signals are not considered further. Usually, however, the detected blind spots and weak signals are included in the strategic planning process as external opinions to be followed-up through strategic projects specified in an action plan.

4. Case: German construction industry

Based on the above explanation of the 360° Stakeholder Feedback for integrating expert judgment in strategic planning processes, we are now going to demonstrate its application to a real-life case from the German construction industry. As part of this case, we wanted to scan the environment of the industry in order to identify potential disruptions and changes for a major player in the German construction industry. Thus, we started applying the 360° Stakeholder Feedback in early 2014 by following its four-step process. First, we selected the stakeholders. We found internal stakeholders by looking at the company's value chain and organization chart. Next, we identified external stakeholders to be representatives from construction material supply companies, customers such as architects or property development companies, regulatory bodies such as the German Construction Ministry, think tanks such as the German construction association, and research institutions in the form of universities focusing on construction courses. In total, we selected 20 internal and 45 external stakeholders.

Having completed the stakeholder selection, we began the data gathering process by sending each of the selected internal and external participants an open questionnaire (see Fig. 5).

The questionnaire contained open questions asking participants to name important factors that would be expected to influence the company for the next five years along the PESTEL dimension. This first questionnaire obtained responses from 16 internal and 20 external stakeholders. Having obtained a total of 309 influential factors from the 36 different respondents, we condensed them down to 42 factors by synthesizing and clustering the collected factors according to common words and similar content. Here, we followed the approach explained above. We then sent a second questionnaire containing the 42 factors thus identified to the 36 first questionnaire respondents. In the second questionnaire, the respondents were asked to assess the impact that each of these influential factors will have on the future financial performance of the German construction industry over the next five years, as well as how uncertain the future development of each factor is. All 36 participants returned the second questionnaire (see Fig. 6).

Once all of the data had been collected successfully, we conducted the blind spot and weak signal analysis. In a first step, we split the collected data into the 16 internal and 20 external experts identified previously. Next, we looked at the factor ratings for the impact and uncertainty dimensions respectively, comparing the evaluation of each factor in each dimension between the two groups. This was done using a spider diagram graphic (see Figs. 2 and 3). Examining the impact dimension, eleven blind spots were identified, namely (1) "development of rental prices in Germany", (2) "development of the trend towards renovation rather than building new", (3) "software developments for planning and simulating surface construction projects", (4) "development of intelligent building technology", (5) "development of automation in surface construction projects", (6) "development of existing construction zones in Germany", (7) "development of energy savings through more efficient construction machines", (8) "development of public tender processes in surface construction projects", (9) "development of Private Public Partnerships (PPPs)", (10) "development of competition in surface construction from Asia" and (11) "development of the ongoing consolidation of the German surface construction industry". The external experts' evaluations of the impacts of these developments on the financial performance of the construction company were significantly higher than those of the internal experts. The picture that emerged for the uncertainty dimension was slightly different, with ten blind spots identified. These were (1) "development of public tender processes in surface construction projects", (2) "prohibition of certain materials (e.g. aluminum, PVC-U etc.)", (3) "development of warranty regulations for construction products", (4) "development of energy savings through more efficient construction machines", (5) "development of public investments in infrastructure projects", (6) "development of intelligent building technology", (7) "introduction of a housing tax for existing non-isolated buildings", (8) "development of demand for commercial properties", (9) "software developments for planning and simulating surface construction projects" and (10) "development of existing construction zones in Germany". We discussed the blind-spots thus identified with executives from the construction company for which we did the scenario project. The differing ratings of the external and internal experts triggered a fruitful discussion within the top management team. As a result, they decided to consider these influential factors more thoroughly as part of their strategic planning process. Specifically, the blind spot "prohibition of certain materials (e.g. aluminum, PVC-U etc.)" was examined further in a strategic project that analyzed what materials could be used in construction projects instead of

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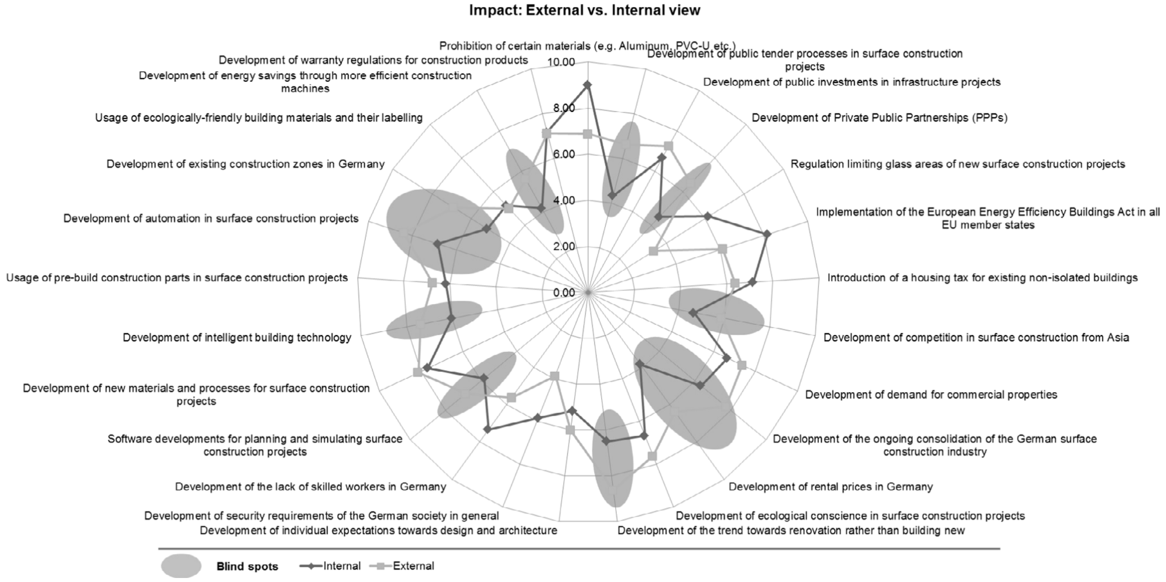

Fig. 2. Blind spot analysis, impact dimension.

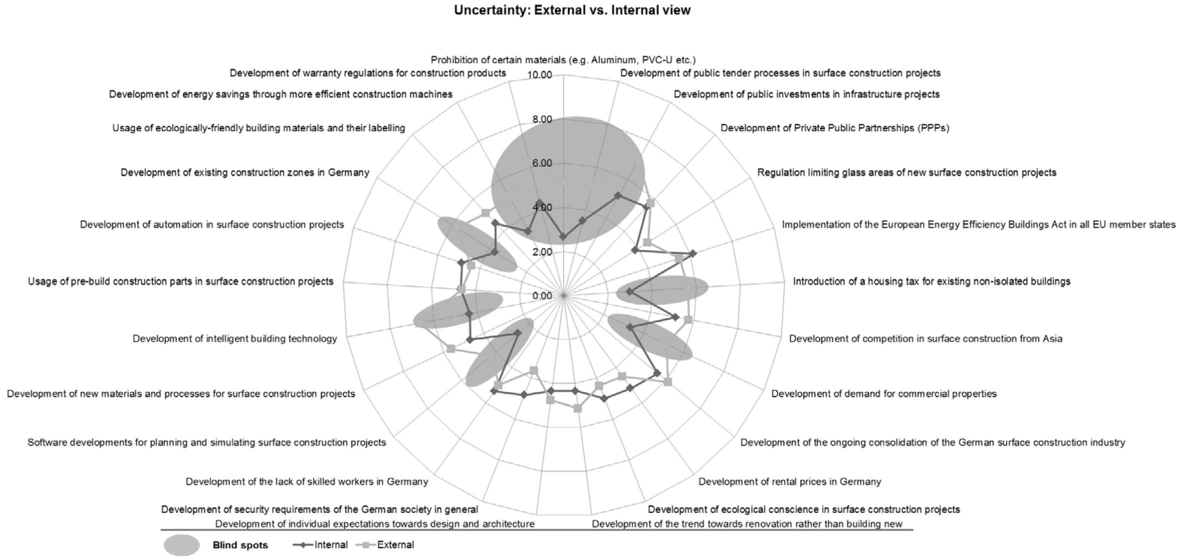

Fig. 3. Blind spot analysis, uncertainty dimension.

aluminum. Moreover, the blind spot analysis also highlighted the importance of lobbying efforts in an attempt to extend or even avoid a deadline after which the use of certain materials would be prohibited. In particular, the quantification of blind spots as the difference between the ratings of internal and external experts exemplified the strategic importance of several factors, and thus the need to derive countermeasures in a strategic action plan.

As a second step in the data analysis, we looked for weak signals. We first examined the numbers of citations or mentions of each factor in the first questionnaire round. We only considered those factors to be relevant for the weak signal analysis that were mentioned by a maximum of three of the 36 experts, representing approximately 8% of the total expert population asked. This gave us a total of 10 influential factors to be considered for the weak signal analysis. In the next step, we looked at the impact and uncertainty ratings of each of the factors in the second questionnaire round. Here, we only considered to

Weak Signal analysis

# of citations questionnaire round 1	Impact rating round 2	Uncertainty rating round 2	Weak Signal
1	7.00	5.79	Implementation of the European Energy Efficiency Buildings Act in all EU member states
2	5.36	5.50	Development of competition in surface construction from Asia

Fig. 4. Weak signal analysis.

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Scenario Planning for the German construction industry

1. **Please name important POLITICAL FACTORS that will have crucial influence on the German construction industry within the next 5 years and think of indicators to measure the factors:**

Influence factors	Indicators

2. **Please name important ECONOMIC FACTORS that will have crucial influence on the German construction industry within the next 5 years and think of indicators to measure the factors:**

Influence factors	Indicators

3. **Please name important SOCIETAL FACTORS that will have crucial influence on the German construction industry within the next 5 years and think of indicators to measure the factors:**

Influence factors	Indicators

4. **Please name important TECHNOLOGICAL FACTORS that will have crucial influence on the German construction industry within the next 5 years and think of indicators to measure the factors:**

Influence factors	Indicators

5. **Please name important ECOLOGICAL FACTORS that will have crucial influence on the German construction industry within the next 5 years and think of indicators to measure the factors:**

Influence factors	Indicators

6. **Please name important LEGAL FACTORS that will have crucial influence on the German construction industry within the next 5 years and think of indicators to measure the factors:**

Influence factors	Indicators

Fig. 5. Open questionnaire round 1.

Scenario Planning for the German construction industry

Please rate the following factors from 1 (low/weak) to 10 (high/strong).

POLITICAL FACTORS	IMPACT	UNCERTAINTY
Prohibition of certain materials (e.g. Aluminum, PVC-U etc.)		
Development of public tender processes in surface construction projects		
Development of public investments in infrastructure projects		
Development of Private Public Partnerships (PPPs)		
State actions to increase the renovation rate of existing buildings		
Development of Germany's energy policy		
Regulation limiting glass areas of new surface construction projects		
Implementation of the European Energy Efficiency Buildings Act in all EU member states		
Development of climate rules for new buildings		
Further opening of the European job market for foreign workers		
Introduction of a housing tax for existing non-isolated buildings		
Introduction of a cap on rent increases		
ECONOMICAL FACTORS		
GDP development in Germany		
Development of raw material prices for building materials		
Development of competition in surface construction from Asia		
Development of demand for commercial properties		
Development of the ongoing consolidation of the German surface construction industry		
Development of rental prices in Germany		
Development of purchasing power of private German households		
Increasing investments in material assets		
SOCIETAL FACTORS		
Development of ecological conscience in surface construction projects		
Development of urbanization		
Development of the German population		
Development of the trend towards renovation rather than building new		
Development of the number of individuals per household in Germany		
Development of individual expectations towards design and architecture		
Construction projects being performed by a general contractor without the influence of externals		
Development of security requirements of the German society in general		
Development of the lack of skilled workers in Germany		
TECHNOLOGICAL FACTORS		
Software developments for planning and simulating surface construction projects		
Development of new materials and processes for surface construction projects		
Development of intelligent building technology		
Usage of pre-build construction parts in surface construction projects		
Development of automation in surface construction projects		
ECOLOGICAL FACTORS		
Importance of ecologically-friendly surface construction		
Development of existing construction zones in Germany		
Usage of ecologically-friendly building materials and their labelling		
Development of energy savings through more efficient construction machines		
Development of climate change and its impact on surface construction in general		
LEGAL FACTORS		
Development of construction laws towards tighter ecological standards		
Development of warranty regulations for construction products		
Development of tax-savings achieved through surface construction projects		

Fig. 6. Closed questionnaire round 2.

be relevant those factors that had impact and uncertainty ratings above five. With these prerequisites, two factors turned out to be weak signals: (1) "implementation of the European Energy Efficiency Buildings Act in all EU member states" and (2) "development of competition in surface construction from Asia". We discussed these weak signals thoroughly with the construction company's executives. They agreed on the first influential factor as having the

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potential to disrupt the German construction industry, but questioned whether Asian construction companies would really be able to enter the German market over the next five years. Here, they questioned the timing more than the idea that Asian competitors will enter the German market at some stage.

Applying the four-step 360° Stakeholder Feedback process to the German construction industry thus allowed the participating executives to integrate external expert judgment into the strategic planning process. Moreover, the process quantitatively highlighted some future challenges that the organization was not prepared for sufficiently. Based on the 360° Stakeholder Feedback process, the organization was able to integrate these factors into its strategic planning efforts, thus including the opinions of external experts and enabling a better rounded expert judgment when it comes to making strategic decisions.

5. Comparison to extant approaches for eliciting expert judgment

The 360° Stakeholder Feedback technique provides a structured way of identifying and quantifying weak signals and blind spots in the scenario planning process. We argue that it is a valuable complement to existing methods in the field. It differs from widely used techniques such as Delphi, the Q2 Technique and the Strategy Radar along three main dimensions, namely the ways in which conflicting judgments are aggregated, dissent is introduced into the judgment process, and differences in judgment are analyzed in the process (see Table 2). This gives our new approach specific advantages and disadvantages relative to extant group-based judgmental forecasting and anticipation methods.

We argue that the 360° Stakeholder Feedback approach's biggest advantage over Delphi, the Q2 Technique and the Strategy Radar is that its analyses are conducted both across different points in time *and* across groups. This allows for the analysis of differences in judgment across different internal and external stakeholder groups, which builds the methodological foundation for the quantification of weak signals and blind spots as part of the process. Other techniques predominantly use analyses across different points in time throughout the process to analyze differences in judgment; for instance, the Delphi technique is based on feedback mechanisms across different rounds (Rowe & Wright, 1999). These comparisons can be extremely useful in showing how judgment evolves and how differences in judgment are integrated over time. However, they do not allow for a quantitative analysis of blind spots and weak signals.

Also, each of these methods for eliciting expert knowledge as part of the scenario process introduces dissent differently. Both the Delphi method and the Q2 Technique introduce dissent during the process itself by enabling feedback loops that allow judgment to be reflected as part of the process (Rowe & Wright, 1999; Von Der Gracht, 2012). In contrast, the Strategy Radar and 360° Stakeholder Feedback approaches introduce dissent mainly as a result of the project. The Stakeholder Feedback technique, for example, fosters a discussion of blind spots and weak signals at the end of the analysis. While this can result in cognitive and intragroup benefits (Bonaccio & Dalal, 2006; Meissner & Wulf, 2014), it may also lead to a less accurate aggregation of expert judgment. The Delphi method, on the other hand, may produce a more accurate picture of the experts' aggregate opinions, based on the multiple feedback rounds that are built into the process.

In addition, the Stakeholder Feedback uses averages at a single point in time to aggregate conflicting judgments in the respective evaluations, while other methods rely on a more holistic combination of different qualitative and quantitative methods (Strategy Radar) or an equal weighting of judgments at the end of a round repeated over multiple rounds (Delphi method). These methods may therefore yield a more fine-grained picture of the nuances and variance in expert judgment, which can be very important in controversial decision processes or in instances where there is a large information asymmetry between participants.

This comparison shows that each method for the elicitation of expert knowledge has specific advantages and disadvantages that imply its own strengths in specific fields of application. As a result, these methods can complement each other, and may be used in a combined fashion when applied in corporate practice.

6. Discussion

The identification of weak signals and blind spots is a major challenge in strategic planning processes in general and scenario planning projects in particular. In spite of recent methodological research in the domain that has suggested various different ways of eliciting, quantifying and structuring the knowledge of experts (Aspinall, 2010; Morgan, 2014; Rowe & Wright, 2011; Schoemaker et al., 2013), the analysis of the weak signals and blind spots that show up as a result of such expert knowledge elicitation is an issue that has not been discussed in most of the literature on scenario planning to date.

The 360° Stakeholder Feedback technique introduced in this paper contributes to the literature on scenario planning and the elicitation of expert knowledge by providing a quantitative tool for the generation and aggregation of expert judgment in the scenario process based on stakeholder-oriented logic. Specifically, the process allows for a quantification and visualization of blind spots and weak signals, which can then be used to foster debate among the management team and reduce the judgmental biases in the decision process.

From a practical perspective, this paper provides a structured framework that can be used to detect subconscious misconceptions in executive judgment. It can be used to obtain a general overview of important changes in the firm's periphery, and thus provides an effective method for environmental scanning (Day & Schoemaker, 2005; Schoemaker & Day, 2009). In addition, it can also be integrated easily into scenario-based planning processes. Here, the technique provides a holistic list of influencing factors across the PESTEL dimensions that can be used as an input for an impact/uncertainty analysis and the

Table 2
Comparison of approaches to the elicitation of expert judgment.

	How are conflicting judgements aggregated?	How is dissent introduced into the judgement process?	How are differences in judgement analyzed in the process?
Delphi method	Equal-weighting of judgement at the end of a round	During the process	Across different points in time
Q2 technique	Table of themes, variables and their future states	During the process	Across different points in time
Strategy radar	Combination of different qualitative and quantitative methods	End of the process	Across different points in time
360° stakeholder feedback	Single point in time average	End of the process	Across different points in time and across groups

scenario development itself (Schwenker & Wulf, 2013; Van der Heijden et al., 2002).

From a research perspective, the paper opens additional avenues for conceptual and empirical investigations in the domains of expert knowledge elicitation and scenario planning. By introducing a new approach for scanning the firm's periphery and aggregating judgment, this paper builds upon methodological advances in the planning literature. It complements existing methodologies in the field by providing a new process for quantifying and analyzing blind spots and weak signals in scenario planning projects. It can also be used to inform expert knowledge elicitation processes in other fields, and provides an additional perspective that may offer interesting methodological additions to existing methods in the domain.

However, given the importance of an accurate integration of judgment in the strategy process, we call for additional conceptual research that proposes improved methods and frameworks for the integration of expert judgment in the planning and decision making processes (Gnatzy, Warth, von der Gracht, & Darkow, 2011; Von Der Gracht, 2012).

Also, the methodological diversity that results from the use of a broad set of frameworks for this purpose calls for a corresponding detailed analysis of the proposed benefits of the respective tools. We therefore also suggest a more empirically oriented research agenda in the domain that focuses on comparative studies that analyze the relative effects of the frameworks for reducing biased judgment, thus improving decision quality or performance in the organization. For instance, such studies could analyse the effectiveness of tools like the Q2 technique, the 360° Stakeholder Feedback or the Delphi method in comparative research designs in the context of scenario planning (Schoemaker et al., 2013). In addition, such studies could continue to compare the effectiveness of other different methods of expert knowledge elicitation, such as the Cooke method (Aspinall, 2010), with that of the new approach introduced in this paper. This research could shed new light on the sorts of applications and specific purposes for which each method might prove most effective.

In summary, we believe that future research in the domain can be a significant help to academics and practitioners who wish to gain a better understanding of the underlying mechanisms of expert judgment, which is of particular importance given the greater complexity and volatility that decision makers have to deal with in organizations today.

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