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A TEST OF PERCEPTUAL ACCURACY AND OVERCONFIDENCE IN A STRATEGIC ISSUE CONTEXT

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ABSTRACT

There is growing evidence that managers perceive the general environment inaccurately, but very few studies have looked at the accuracy of specific strategic issue probability estimates, and at whether or not managers are aware of the accuracy or inaccuracy of their perceptions, something referred to as knowledge miscalibration. I explore perceptual inaccuracy and knowledge miscalibration in the form of overconfidence, in the context of demographic ageing, an issue currently affecting the tourism and hospitality industry. Using data from a survey of hotel managers, I find a high prevalence of perceptual error and evidence of a relatively large minority of respondents displaying knowledge overconfidence. Furthermore, I find a link between accurate environmental perceptions and strategic issue importance, suggesting that managers are better at accurately perceiving an issue when it is strategically important for their business. The same link does not exist with overconfidence, lending support to scholars arguing that overconfidence may be a trait, rather than being question-specific.

Keywords: Perception, accuracy, perceptual errors, strategic issue, environment scanning, uncertainty

INTRODUCTION

A key role of top managers is to estimate the likelihood of current and future changes in the external environment, and whether these will impact their business. Such estimation could be complicated by overconfidence, a phenomenon widely described in the psychology literature. Overconfidence can manifest itself as knowledge miscalibration, whereby people overestimate their own ability to predict the likelihood of events, or underestimate the volatility of random events. The effects of such knowledge miscalibration are largely unknown in practice. There are some indications from a recent study in finance that CFOs overconfident in their ability to predict stock return, lead their organizations into more aggressive corporate policies, bigger investments, and more debt financing (Ben-David, Graham, and Harvey, 2013). How common are inaccurate perceptions about more specific strategic trends in the environment, and are managers typically aware of their own misperceptions? These questions have only recently started to receive serious attention from management researchers (Garrigos-Simon, Palacios-Marques, and Narangajavana, 2008; Hill, Kern, and White, 2014; Mezias and Starbuck, 2003).

The implications of inaccurate perceptions may be important. Inaccurate perceptions may be detrimental to strategic planning and decision-making. In short, plans made on the basis of incorrect assumptions about trends and issues in the environment may be more likely to fail. The

implications for researchers are equally serious. Scholars often rely on data gathered by interviewing or surveying managers, and the implications of ubiquitous perceptual errors are that managers may not be useful informants about their organizations and environment (Mezias and Starbuck, 2003).

The literature on managerial forecasting (i.e. predictive) inaccuracies and overconfidence in the context of salient strategic issues in particular is sparse (Walsh, 1995). What evidence we have considers much more general aspects of the environment, such as perceived environmental uncertainty. When making strategic decisions, managers may be affected by general perceived environmental uncertainty, but they are likely to make decisions based on their perceptions of much more specific changes, issues, and trends. For example, the perceived likelihood of competitors' actions, of changes in the habits of customers, and so forth. In this chapter I demonstrate a way to capture this kind of issue-specific perceptual inaccuracy, and the level of overconfidence. An unanswered question, which I also start to address in this chapter, is whether the strategic importance of an environmental issue moderates managers' perceptual inaccuracy and overconfidence in that issue.

The scanning literature tells us that executives scan the environment selectively, focusing their attention on areas of the environment that are strategically important (Boyd and Fulk, 1996). If this is so, then the degree of accuracy of an executive's perceptions of an environmental issue might be similarly influenced by the strategic importance of the issue in question for their organization. In other words, it may be perfectly logical for an executive to be uninformed about

events that do not matter to their organization, as he focusses his attention on areas of the environment he believes will matter most. Inaccurate perceptions may not be a problem.

I offer some evidence to support this line of investigation. Data from a survey of 254 hotel general managers suggests that inaccurate perceptions about a given specific issue in the external environment may be very common. Furthermore, the problem of overconfidence and of miscalibration in general, although existent, may not be quite as widespread as some researchers would have it (Pillai, 2010; Powell, Lovallo, and Caringal, 2006). I find some evidence to suggest that strategic importance is associated with more accurate perceptions, but I find only mixed evidence as to any association between perceptual accuracy and performance, indicating that accurate perceptions may not be directly and immediately linked to organizational performance. These findings are important as they indicate either that the accuracy-performance relationship is more complex, or that the accuracy of perceptions of the environment may not be as important as some authors have suggested. As Sutcliffe (1994, p. 1374) puts it, “having an accurate environmental map may be less important than having some map that brings order to the world and prompts action”.

OVERVIEW OF RELEVANT LITERATURE

Executives have been called information workers, who observe and interpret signals from the environment, before acting on their perceptions on behalf of their organization (McCall and Kaplan, 1985; Porac, Thomas, and Baden-Fuller, 1989). It is often implicitly or explicitly

assumed by scholars that a greater match between these managerial perceptions of the environment and actual environmental characteristics leads to higher performance (Bourgeois, 1985; Sutcliffe, 1994). However, this view has been challenged. A growing number of studies show that what executives perceive very often does not coincide with objective reality, suggesting that inaccurate perceptions may be more ubiquitous than previously thought (Mezias and Starbuck, 2003; Sutcliffe, 1994). One reason for this could be that very general perceptions of the environment are not critical for organizational action. Instead, specific strategic issues and events are what capture the attention of managers and drive managerial interpretation processes.

A related question that has received very little attention in management research is whether managers are aware of their own perceptual errors. Knowledge calibration refers to the extent to which there is a match between accuracy and confidence. In the psychology literature, numerous studies report systematic overconfidence bias, whereby individuals overestimate the accuracy of their own perceptions (Kahneman, Slovic, and Tversky, 1982; Klayman *et al.*, 1999). This is particularly the case in situations where individuals are given general knowledge questions to answer or when questions are complex (Alba and Hutchinson, 2000; Gigerenzer, Hoffrage, and Kleinbolting, 1991). There is growing evidence that overconfidence, at least when revealed through probability evaluation techniques, has the characteristics of a stable trait (Björkman, 1992; Hansson, Juslin, Winman, 2008; Pallier, Wilkinson, Danthiir, Kleitman, Knezevic, Stankov, and Roberts, 2002), which makes it all the more relevant to consider its implications for management and organizations. Despite a large amount of research on the calibration of knowledge in the field of psychology, very little research has investigated the potential effects of

miscalibration in the area of management. However, there is a long tradition in management studies of cognition of studying discrepancies between subjective and objective measures of very general environmental characteristics, which I will rapidly survey, before proposing a way of approaching the measurement of strategic issue-specific perceptions and overconfidence.

Perceptual Accuracy and Performance

Studies of executives comparing perceptual and objective measures of industry characteristics are by no means numerous (Mezias and Starbuck, 2003; Starbuck and Mezias, 1996; Sutcliffe, 1994). Such studies as have been conducted tend to find relatively large differences, indicating that managers may not accurately perceive rates of environmental change, environmental munificence, complexity and instability. There is some evidence that perceptions are more similar within organizations than across organizations (Sutcliffe and Huber, 1998), but such similarities neither explain nor necessarily affect the degree of error. The following paragraphs provide an overview of such existing studies.

Early studies tended to miss the fact that managerial perceptions could be widely inaccurate. Tosi, Aldag and Storey (1973) asked 102 executives to assess the degree of certainty in three sub-systems of their organizations: production, marketing and research. They then compared the results with volatility measures derived from archival data and found low and inconsistent correlations between the subjective and objective measures. They concluded that a range of methodological issues were to blame for the discrepancies between subjective and objective measures. In a similar study Downey, Hellriegel and Slocum (1975) tested both Lawrence and

Lorsch's (1969) and Duncan's (1972) perceived environmental uncertainty questionnaires on a group of 51 divisional managers of a conglomerate. They found a lack of commonality between the two uncertainty scales and a generally low correlation with objective measures they collected. Their explanations for the low correlations again hinged on methodology rather than perceptual errors per se, and are in their words "all based upon conjectures which need to be examined in future research... [and] suggest that considerable care should be exercised in selecting existing instruments for uncertainty measurement" (Downey *et al.*, 1975). In a separate review of the literature on perceived environmental uncertainty, Downey and Slocum (1975) are probably the first to suggest, without testing, a variety of factors that in addition to objective environmental characteristics may explain how executives perceive the environment, including individual cognitive differences, such as individual tolerance for ambiguity.

Keats and Hitt (1988) examined 110 organizations using a different approach of comparing archival and perceptual measures of munificence, instability and complexity. Their perceptual measures were based on an examination by two judges of qualitative statements in the annual reports of 39 of their sampled organizations. Their conclusion was that there was a moderate correlation between the three dimensions of uncertainty as measured by their two methods ($r = 0.40$ to 0.59). Snyder and Glueck (1982) used Tosi *et al.*'s (1973) method of calculating environmental volatility based on archival data and contrasted this with the perceptions of stockbroker analysts. They reported a high correlation between their two measures of volatility. Common to all these studies is that they again tend to assume that discrepancies between objective and subjective assessments of the environment are due to methodological issues or differences in interpretation, rather than a sign of systematic perceptual errors.

Bourgeois (1985) was the first to explicitly test the hypothesis that a greater match between true environmental volatility and managers' perceived environmental uncertainty would have positive performance implications. He used a modified version of Duncan's (1972) questionnaire along with a volatility index derived from industry statistics and arrived at the conclusion that congruence between perceived environmental uncertainty and the volatility measure was associated with higher performance. A potential limitation of Bourgeois's (1985) study was that he sampled 99 executives within only 20 organizations, and averaged the perceived environmental uncertainty scores within management teams. The averaged perceived uncertainty scores may result in perceptions appearing to be quite accurate, but hiding inaccuracies and disagreements among the members of the various management teams in these organizations (Mezias *et al.*, 2003). In addition, the reliability of Duncan's (1972) scale has been questioned by some (Boulton *et al.*, 1982; Kopp and Litschert, 1980).

McCabe (1990) tested the relationship between congruence in archival and perceptual measures of environmental uncertainty, and organizational performance, in the case of two samples of 84 individuals and 26 companies in total in the airline and the container businesses. The results were a marginally significant correlation in one sample, with no significant correlation in the other. He also found no significant relationship between perceived uncertainty consensus among managers within an organization and performance. It has been suggested that such internal consensus may lead to higher performance, particularly in the case of stable environments (Dess and Priem, 1995; Priem, 1990), but this was not confirmed by the results. Sutcliffe (1994) used a similar method to Bourgeois (1985) to find evidence that organizational scanning as well as

centralization influence the extent to which executives' perceptions of environmental instability are "accurate". The performance implications were not examined in that study and similarly to Bourgeois (1985) she averaged the perceptual data across several managers in each firm. This could lead to overstating the accuracy of executives' perceptions (Starbuck and Mezias, 1996).

Some studies have assessed the accuracy of managers' assessments of their own organizations' performance, rather than their perceptions of the external environment (Mezias and Starbuck, 2003), again reporting surprising degrees of perceptual error. A study by Doty, *et al.* (2006) used several datasets to test whether differences between informant and archival data on the environment could be explained by factors other than perceptual error, such as organizational or individual mediating filters (including decentralization, formalization, tolerance for ambiguity or risk aversion). They conclude that "there is some evidence that the observed divergence between archival and informant measures may reflect real differences between constructs, but more and possibly stronger evidence that this divergence represents perceptual error or bias on the part of the manager" (Doty *et al.*, 2006, p. 274). A recent study tried to identify factors that may affect hotel managers' accuracy of perception (Garrigos-Simon, Palacios-Marques, and Narangajavana, 2008). That study used the perceptions of selected industry experts as objective measures of a variety of hypothesized effects of the internet on the competitive environment of hotels. These perceptions were then compared to the perceptions of a sample of Spanish hotel directors to assess perceptual accuracy. The authors reported that the overall explanatory power of their model was quite low, possibly supporting the notion that such differences in perception are the result of true errors or biases.

I would conclude that despite growing evidence for cognitive inaccuracies, the results are imprecise, and little evidence exists regarding the performance implications of such inaccuracies, and studies use widely different measures, making direct comparisons between studies impossible (Hill, Kern, and White, 2014). Furthermore, little effort has been made to use a specific environmental issue as the context within which to measure perceptions and accuracy, previous studies preferring the use of very general perceived environmental uncertainty instruments. The problem with such wide constructs and measurement instruments is that they may be so unspecific that they are open to individual interpretation by managers. Asking an executive to evaluate on a scale of 1 to 5 a question such as “how often do you believe that the information you have about government regulatory control over industry is adequate for decision making” (Duncan, 1972), may not help us evaluate knowledge accuracy. Such questionnaires do more than ask executives to predict or estimate states of the environment, they also ask for very individual interpretations about what is being asked, and about the environment, thus making it difficult to conclude that inaccuracies are attributable to misperceptions per se (Starbuck and Mezias, 1996).

Similarly, many of the objective measures of the environment used are very wide, and may be imperfect indicators of the state of the environment. For example, Bourgeois (1985) created measures of volatility based among others on year-on-year differences in the projections of industry output from the Department of Commerce, over a five-year period. This kind of measure suffers from multiple problems. For example, why a five year period? Why industry projections, when these will suffer from margins of error? Why industry-wide, when most companies are affected mainly by volatility within very specific industry segments? By adopting

very generalized and wide measures of objective uncertainty, and trying to compare these to the results of very general survey instruments that are open to respondent interpretation, these types of studies have been comparing apples and oranges, and it is therefore no surprise that the results have been so unclear.

I suggest a different methodology whereby specific environmental changes or trends are selected for which there is a quantifiable objective likelihood, which can then be contrasted with a manager's likelihood estimate, resulting in a direct comparison between objective and perceived likelihood. Combining this with a measure of declared estimation uncertainty allows us to construct a simple measure of overconfidence. Perceptual error and overconfidence can then be used to test performance or other effects. To illustrate I will first discuss a number of hypotheses that could be tested, and then conduct the analysis based on data from a survey effort also described in Sund (2013).

Scanning and Strategic Importance

Executives do not focus their attention equally on all parts of the environment, but tend to focus on specific environmental sub-sectors, due to natural time and resource limitations (Ebrahimi, 2000). Executives thus scan the environment selectively (Daft, Sormunen, and Parks, 1988; Garg Walters, and Priem, 2003). The sectors of the environment more likely to be scanned are those perceived as strategically important by the executive (Boyd and Fulk, 1996). This selective focus may help explain perceptual errors. Executives are simply not able to assimilate all information about the environment, nor would it be rational for them to attempt to do so. Organizations are better served if executives focus their attention on information that is strategically important. The

real risk in terms of perceptual errors about the environment lies in errors pertaining to strategically important information. When such information is missed, the quality of strategic decision-making may be affected.

It seems reasonable to suggest that the performance implications of perceptual accuracy are therefore moderated by the strategic importance of getting the perception in question right. In other words, if we define accurate perceptions as the ability to correctly assign probabilities as to the likelihood of future events (Duncan, 1972; Milliken, 1987), then accurate perceptions will lead to higher performance only if the events are strategically important. In this chapter I focus on one case of strategic importance in particular. Strategic importance is here linked to the notion of resource dependency (Daft *et al.*, 1988). Particular sectors of the environment provide critical resources to any given organization and information about these sectors is therefore more strategically important to executives. Accurately perceiving changes that affect key resources, and are thus strategically important, could reasonably be hypothesized to have performance implications.

Hypothesis 1: If the resource dependency linked to a sector of the environment is high, higher perceptual accuracy linked to characteristics and events of that sector will be associated with higher organizational performance.

Knowledge Calibration

Important to the question of perceptual accuracy is also the issue of knowledge calibration and over-confidence. Overconfidence is used in the literature to cover several types of

overconfidence, such as overestimation, overplacement and the calibration of subjective probabilities (Olsson, 2014). Overestimation typically compares a person's performance with their own belief of performance. Overconfidence in this case relates to the overly positive estimation of one's absolute performance. Overplacement compares a person's own performance with that of others. In this context, overconfidence is when a person has too positive estimates of their relative performance to others. Finally, calibration of knowledge of probabilities occurs when the executive's belief in the veracity of their perceptions (confidence) matches the correctness of those perceptions (accuracy) (Pillai, 2010). This is typically measured with the use of probability estimates, where subjective probability estimates are compared with objective probabilities. It is this final type of overconfidence that is the focus here, and it should be noted that it is currently unknown to which extent the various types of overconfidence illustrated above are representative of the same underlying psychological construct (Olsson, 2014).

If executives know what they know, and know what they don't know, then inaccurate perceptions may not be very problematic per se. This is because executives are less likely to act if they are uncertain of their own predictions. Existing studies on perceptual accuracy among executives have certainly suggested the existence of inaccurate perceptions, but none of these studies have examined the combination of the accuracy of probability predictions concerning the environment, with executives' own evaluations of their confidence or uncertainty in their predictions.

FIGURE 1 about here

Cell A in Figure 1 refers to a situation where an executive makes accurate predictions regarding the environment, and feels low uncertainty regarding these predictions. Cell B on the other hand, is a situation where the executive makes an error of judgment but feels certain of the prediction, thus exhibiting overconfidence. Cell C is the situation where the executive makes an accurate prediction but feels unduly uncertain about the prediction, exhibiting an unjustified lack of confidence, or underconfidence. Finally cell D is the situation where the executive makes an error but feels uncertain about their prediction, thus exhibiting a justified lack of confidence. If executives were calibrated, we would expect a majority of executives in a survey to find themselves in cell A or cell D.

The psychology literature on cognition contains numerous studies highlighting the pervasiveness of overconfidence (Alba and Hutchinson, 2000). One of the most common explanations for such overconfidence has to do with the way we deal with information search. When faced with a question or problem, individuals first conduct a rapid search of their memory for a possible response, and once one has been formulated, look for additional evidence to support that response (Klayman *et al.*, 1999). That initial response is selected based on familiarity. Further search is carried out with the aim of formulating an explanation for why the initial response is true (Sieck, Merkle, and Van Zandt, 2007), and although this process creates a bias, individuals do not perceive this, thus finding more support for their response than is warranted. The effect of this is a tendency for overconfidence in the general population regarding probability estimation.

We would expect to see this carry over from the general population to a population of managers considering strategic issue probabilities.

Hypothesis 2: Overconfidence in executives regarding their own predictions is more prevalent than under-confidence.

As described earlier, if executives with inaccurate perceptions are uncertain of their own predictions, it seems unlikely they would make important decisions based on these predictions (Maule and Hodgkinson, 2003). On the other hand, if suffering from overconfidence, an executive might well make the wrong decisions, with possible performance implications. A single such decision is unlikely to have major performance implications in the context of perceptions about general issues in the external environment. However, if overconfidence is a trait, as suggested by some of the psychology literature, then these decisions are likely to accumulate over time, with possible performance implications. It is thus plausible that knowledge calibration is associated with higher organizational performance in general and overconfidence associated with lower performance.

Hypothesis 3: Higher levels of knowledge calibration are associated with higher organizational performance.

METHOD

In order to test the hypotheses, I analyzed the results of a survey carried out among all 2,183 classified hotels in Switzerland, in cooperation with the Swiss Hotel Association (SHA). The survey was addressed to hotel directors (general managers). Data from this data set has previously been reported on in Sund (2013). The setting limits the analysis to a single industry and nation, which should help eliminate variance in the data linked to industry-specific factors. The hypotheses are tested with reference to a particular environmental change that is likely to affect the Swiss hospitality industry within the foreseeable future, namely the demographic ageing currently occurring. According to data published by the Swiss Federal Statistical Office, the proportion of the population aged 65 and above will rise from around 15.5% in 2006 to 23% by 2030. In absolute terms the number of persons aged 65 and above will rise by over 50% in that same time period. According to the 2006 edition of "Swiss Tourism in Figures", a yearly publication of the Swiss Tourism Federation, Swiss hotels depended that year for over 44% of overnights on the domestic market. A similar trend is affecting most of Europe, from where a large majority of outside visitors to Switzerland originate.

There is extensive evidence in the tourism and hospitality literature that people change both their travel intensity and travel preferences with age (Sund and Boksberger, 2007). Given the relatively objective certainty of the ageing population phenomenon (objectively the likelihood approaches 100% that this environmental change will take place), and given that this will objectively affect the Swiss hotel industry in general, using this particular environmental change to test the hypotheses should fit with the purpose of this chapter. In total 254 usable questionnaires were filled in online (11.6%). The response rate and sample size is similar to those reported in previous studies of a similar nature in the hospitality industry (Alvarez Gil,

Burgos Jimenez, and Lorente, 2001; Tajeddini, 2010). Sample representativeness was confirmed by comparing the sample proportion of respondents belonging to different hotel categories (1* to 5*), with the actual proportion of hotels in those categories. This verification was particularly important in order to assess the risk of non-response bias. The various hotel categories were well represented. A test for differences between early and late responders was done and revealed no problems.

The measurement of executives' perceptions and perceptual uncertainty followed Milliken (1990). Respondents were given the following statement: "An increase in the number of elderly persons has been predicted in Switzerland for the time period 2006 to 2025", and subsequently asked to estimate the probability of this increase taking place. Then they were asked how certain they were of their estimate on a 7-point Likert-type scale, 7 meaning extremely certain. Perceptual accuracy was measured as the difference between the objective probability, approximated at 100%, and the estimate provided by the executive. The higher the probability predicted by an executive, the more accurate that prediction.

Resource dependency was measured by asking respondents the following question: "How important is the senior segment (65+) to your hotel today?" Four possible answers were (a) less than 25% of all guests, (b) between 25% and 50%, (c) between 50% and 75% and (d) over 75% of all guests. The higher the proportion of senior guests staying in these hotels, the greater would be their resource dependency on this segment, and the more strategically important would be the ageing population trend to these hotels. Of the total sample of 254 hotels, 107 hotels answered

(a), 104 answered (b), 40 answered (c) and only 3 answered (d). This was too few for (d) to be included in the non-parametric test (see below).

Level of scanning was included in my analysis for exploratory purposes and measured using Miller's (1987) scale. I found the instrument to be reliable, with a Cronbach's Alpha of 0.77. However, the inclusion of one of the four items on this scale actually reduced the level of internal consistency. This item differed from the other three items as it was a far more general test of scanning, and did not ask about specific and deliberate scanning activity, and I therefore removed it and averaged the three items to create a single scanning measure.

Due to many hotels being privately owned and operated, there are only very limited publicly available records of financial performance indicators for this sector. Furthermore, hotel executives are typically somewhat reluctant to provide details of financial performance (Alvarez Gil *et al.*, 2001). This study therefore applied a method measuring performance using questions on occupancy rates, profitability as compared to direct competitors, and overall performance as compared to direct competitors (Alvarez Gil *et al.*, 2001; Claver-Cortes, Molina-Azorin, and Pereira-Moliner, 2006; Miller and Cardinal, 1994; Robinson and Pearce, 1988). The correlation between the two performance measures is considered adequate (0.63). Their relationship with occupancy rate is somewhat lower (i.e. correlation of 0.40 for the relationship between profitability and occupancy, and 0.48 between general performance and occupancy). These results are, interestingly, very similar to those reported by Alvarez Gil *et al.* (2001).

Common method bias is a real risk in this type of study, due to the same respondent providing data for both the explanatory and explained variables (Doty and Glick, 1998). In this study an attempt was made to minimize this risk through design (Podsakoff *et al.*, 2003). The data reported in this chapter formed part of a larger survey. The performance questions were grouped with general demographic variables at the beginning of the questionnaire and were to some extent psychologically separated from both the questions related to prediction and the one related to resource dependency. The questionnaire was thus broken into sections and respondents were shown only a section at a time on screen. In addition to this, effort was put into wording items as clearly as possible, scales for each variable were different and the questionnaire was tested for clarity on a group of industry experts. Harman's single factor test revealed a first factor accounting for 38% of the variance. Thus, no general factor was clearly apparent.

FINDINGS

Table 1 contains descriptive statistics and table 2 correlations between the main variables. An examination of the correlations shows a positive and significant correlation between the respondents' probability estimates and the uncertainty of their estimates. Uncertainty was reverse-scaled, such that a higher score indicates greater confidence in estimates. As the true probability of the ageing population trend is approximately 100%, the higher the probability estimate, the more accurate this estimate. A large majority of our respondents made very inaccurate probability estimates, with around two out of three respondents estimating the probability of population ageing at 50% or less. This result confirms that perceptual errors are

common not just in the case of very general estimates of environmental characteristics, as tested in previous studies, but also when one studies a very specific environmental issue. In fact, the high degree of error was surprising, given that the ageing population trend has received some attention in general media.

TABLES 1 and 2 about here

The relatively high and significant correlation between perceptual accuracy and prediction uncertainty in our sample suggests that a majority of executives have calibrated predictions. Figure 1 presents this data in a matrix. The results show that a majority of respondents are to be found in two cells. The first is the cell with high accuracy (low error) and low uncertainty, marked cell A. The second is cell D, indicating low accuracy (high error) and high uncertainty. Relatively few respondents exhibited unjustified lack of confidence (cell C), with a somewhat more significant number of respondents displaying some degree of overconfidence. This configuration is as predicted. The result provides some support to hypothesis 3 and the notion that overconfidence is more common than unjustified lack of confidence.

Testing hypothesis 1 requires an examination of the link between accuracy and performance whilst taking into account the extent to which the organizations studied depend on the senior customer segment. An initial examination of the correlation matrix in table 2 indicates a highly significant correlation between perceptual accuracy and general performance, a somewhat

significant correlation with profitability, but no correlation with occupancy level. There is thus only limited support for a direct association between accuracy and performance. To test hypothesis 1 the sample was divided into 4 groups based on resource dependency levels. A visual check of scatter plots of the single performance index against perceptual accuracy was carried out to check for linear relationships in the four groups. Results indicated positive linear relationships in all four groups but with low fits in the first three groups (r^2 of 0.05, 0.04 and 0.005 respectively for groups a, b and c). Levene's test was not significant ($p = 0.11$) indicating that the homogeneity of variance assumption was not violated. A one-way analysis of covariance indicated only weak support for the notion that higher accuracy is associated with higher performance when strategic importance (in this case measured by resource dependency) is controlled for ($p = 0.1$). These results are found in table 3. Finally, table 4 contains the accuracy and uncertainty scores for the four groups. Overall, the results are too weak to provide definitive support for hypothesis 1, although the results certainly do not suggest a downright rejection of the hypothesis. A separate Kruskal-Wallis test revealed significant differences between the three groups (a, b, and c) in terms of accuracy ($p = .019$), with the high resource dependency group (c) being more accurate than the other two, and no significant differences for overconfidence levels.

As would be expected from hypothesis 2 and as can be seen in figure 1, the data does not support a simple diagonal linear relationship, with calibration levels randomly distributed around this diagonal. Rather, the data suggest that overconfidence is more prevalent than under-confidence. To calculate the degree of overconfidence I calculated two measures of miscalibration. The first was the distance compared to the perfect diagonal line of calibration of each individual

respondent. This measure gives us a measure close to the theoretical definition of overconfidence.

I also sought to estimate the distance from a modelled average respondent, which gave the second measure. The model with the best fit (r^2 of 0.44) is a cubic model with the following specification, where y is the perceived probability and x is the perceived uncertainty:

$$y = 0.001x^3 + 0.009x^2 - 0.008x + 0.228$$

By computing the level of miscalibration as the absolute value of error (i.e. the distance between observed and predicted perceived probabilities), it is possible to examine hypothesis 3 from two perspectives: the degree of overconfidence, and the level of miscalibration compared to the mean. The performance effects are not clear in the data. The data shows no significant correlation between the two measures of miscalibration and the three measures of performance.

A significant correlation (r^2 of 0.298) between uncertainty and miscalibration, and uncertainty and overconfidence (r^2 of 0.364) reveals that a higher degree of certainty is associated with higher levels of miscalibration and overconfidence. This is self-evident. Roughly speaking, and due to the relative absence of under-confidence, we can determine two clear categories of managers in our sample. The first comprises those with low accuracy and high uncertainty (cell D in figure 1), and those with high accuracy and high certainty (cell A), who are all calibrated. The second group comprises those with low accuracy but high certainty (cell B), showing overconfidence. For those individuals an external measure of performance could be needed to

validate their self-declared performance in the survey, given their lack of calibration. Thus, despite the lack of evidence in the data for an association between overconfidence and performance, we cannot firmly eliminate the possibility. The overconfident managers may simply be overestimating their company's performance.

A final question I explored with the data set was the question of scanning, and its association with perceptual accuracy and overconfidence. A simple correlation analysis reveals some interesting results. Firstly, contrary to what some of the literature suggests (Sutcliffe, 1994; Durand, 2003), I do not find any association between the degree of scanning and accurate perceptions. Secondly, I find that higher scanning is associated with higher certainty, but also higher levels of overconfidence (but not miscalibration). If overconfidence is a character trait, as some of the literature suggests, I infer that overconfident managers in general feel higher levels of certainty and actually spend more time scanning the environment, but this does not translate into more accurate perceptions, a point they do not realize themselves.

DISCUSSION AND CONCLUSION

In this chapter, I have demonstrated a way to approach the measurement of the perceptual accuracy of managers that relies on asking very precise questions about the perceived likelihood of changes or trends in the external environment, and comparing answers to objective probabilities. This in contrast to the many existing studies that have typically asked more general questions, and compared answers to more general measures of environmental characteristics. By

assessing the respondent's uncertainty related to their probability estimate, it becomes possible to measure overconfidence as well. Although I have demonstrated this only for a single environmental trend, the method could be used to measure a sample of managers' estimates of multiple trends, to determine if overconfidence is indeed a stable trait, or is somehow specific to the question asked. It could also be used to explore further the possible links between overconfidence and scanning behavior, which my data suggests might exist.

The debate on perceptual accuracy and performance is far from settled, with the apparent existence of two camps. The first camp consists of those who believe that accurate perceptions are important. This camp would include many researchers in strategic planning and those examining information gathering and use by executives. The common assumption among these researchers is that more and better quality information leads to better decisions and higher performance (Boyd *et al.*, 1993; Daft *et al.*, 1988). From a prescriptive perspective such researchers would suggest the use of systematic scanning and interpretation of environmental data, going as far as considering such information processing as a strategic capability (Durand, 2003). The second camp includes researchers who suggest that organizational sensemaking can function perfectly well without all information or perceptions being memorized and accurate (Das, 2003), since only a very limited amount of information is actually strategically important (Winter, 2003). It has thus been suggested that having a plan, even if it based on the wrong premise, is much better than having no plan at all, and may in fact be sufficient (Das, 2003; Weick, 1995). It has even been suggested that inaccurate perceptions arising from positive illusions may lead to more experimentation and pro-activity, and ultimately lead to higher performance (Daniels, 2003).

The results of the present study may be in favor of the second camp as it adds only very limited evidence to support the proposition that accurate perceptions may be linked to higher organizational performance. Any performance effects of a failure to invest, for example, may only appear over the longer term, if at all. Misperceptions of a single trend may not be an indication of misperceptions of all trends, something that could again be tested with the methodology demonstrated in this chapter, but with a multi-trend setup. Even the degree of knowledge calibration is not associated with performance in this study. Furthermore, scanning is in this data not associated with higher accuracy, perhaps because regular scanning helps understand some trends and not others. Although some performance measures seem to correlate with accurate predictions in this study, the evidence is not unanimous, nor did the attempt to control for resource dependence, or strategic issue importance, improve the results. High strategic issue importance was associated with higher accuracy, but the result was not very strong.

What this study does clearly demonstrate is firstly that executives as a group have inaccurate perceptions, and secondly that many exhibit overconfidence, in the context of specific environmental issue interpretation. These results are important in that this study lends strong support to the notion that inaccurate perceptions are commonplace among executives, even if we consider this at the level of very specific issues as opposed to the general measures of environment used in past studies. A strong relationship between perceptual accuracy and confidence (uncertainty) is found, suggesting that although perceptual errors are frequent, a majority of executives exhibit a high degree of knowledge calibration. However, although

executives are generally aware of the strength of their predictions, there are clear cases of overconfidence, which is associated with higher perceptual error. If overconfidence is indeed a stable trait, as some of the literature seems to indicate, understanding the potential effects of overconfidence in the strategic decision-making context appears very important.

A limitation of this study is that the performance effects in the case of the misperception of a specific environmental issue, or of miscalibration of knowledge, might happen over a longer term. In other words, inaccurate predictions and overconfidence today may lead to performance problems tomorrow. In this study, I have leaned on results in the psychology literature that suggest that miscalibration has the characteristics of a stable trait (Hilton, Regner, Cabantous, Charalambides, Vautier, 2011), such that performance effects might accumulate and thus low performance organizations might have a tendency to be run by overconfident top managers. The characteristics of the data set used here might not be ideal in this regard. For example, general manager tenure might be short, so that by the time performance effects are felt, the overconfident top manager has moved on. Thus, testing performance effects would ideally require a longitudinal rather than cross-sectional study, which represents an opportunity for further studies.

A further limitation is that I here test for one type of overconfidence only, namely overconfidence in probability estimation. There are other types of overconfidence, such as overconfidence in one's abilities, that may be theorized to affect performance. It would be an interesting extension to the analysis in this chapter to measure multiple types of overconfidence, and how these interact with each other and organizational performance.

The implications of the results in this study are nevertheless potentially serious. In answer to the questions posed in the beginning of this chapter, the data set shows clearly that executives are very poor informants regarding specific issues in the external environment of the organization. Furthermore, the overconfidence problem means that asking executive respondents to provide the certainty of their responses may not be a useful way to identify potential error. A poor informant might think they are good. Previous research has suggested that executives within industries have more similar perceptions than between industries (Sutcliffe and Huber, 1998). However, even in our single-industry study an overwhelming majority of executives found it difficult to estimate the probability of a fairly well-publicized environmental issue. Those executives for whom the issue was of strategic importance had somewhat more accurate perceptions, but even they exhibited a high degree of error. The broad implication is that more research is needed to understand the various organizational and individual filters that influence perceptions (Denison et al., 1996), as well as the conditions under which perceptual errors and knowledge miscalibration affects performance. A further implication is that particular care must be exercised in research design and in selecting scales in studies using executives' perceptions (Downey et al., 1975). In the case of studies examining the environment, executives may in fact be quite poor sources of information, and may not always be aware of it. The use of external measures of validation may be the best way to deal with that problem.

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	Mean	Std. Deviation	N
Accuracy	,466	,2904	254
Uncertainty	4,25	1,632	254
Scanning	4,1640	1,26704	254
Occupancy	59,53	15,054	245
Profitability	4,49	1,246	253
GeneralPerf	4,95	1,084	254
Miscalibration	,1988	,18172	254
Overconfidence	,0759	,24071	254

TABLE 1
Descriptive Statistics

	Accuracy	Uncertainty	Scanning	Occupancy	Profitability	GeneralPerf	Miscalibration	Overconfidence
Accuracy	1	,635**	,100	,109	,139*	,169**	-,568**	-,488**
Uncertainty	,635**	1	,268**	,078	,124*	,199**	,091	,364**
Scanning	,100	,268**	1	,179**	,217**	,285**	,072	,182**
Occupancy	,109	,078	,179**	1	,473**	,385**	-,075	-,044
Profitability	,139*	,124*	,217**	,473**	1	,627**	-,064	-,028
GeneralPerf	,169**	,199**	,285**	,385**	,627**	1	,011	,020
Miscalibration	-,568**	,091	,072	-,075	-,064	,011	1	,787**
Overconfidence	-,488**	,364**	,182**	-,044	-,028	,020	,787**	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

TABLE 2
Correlation Matrix

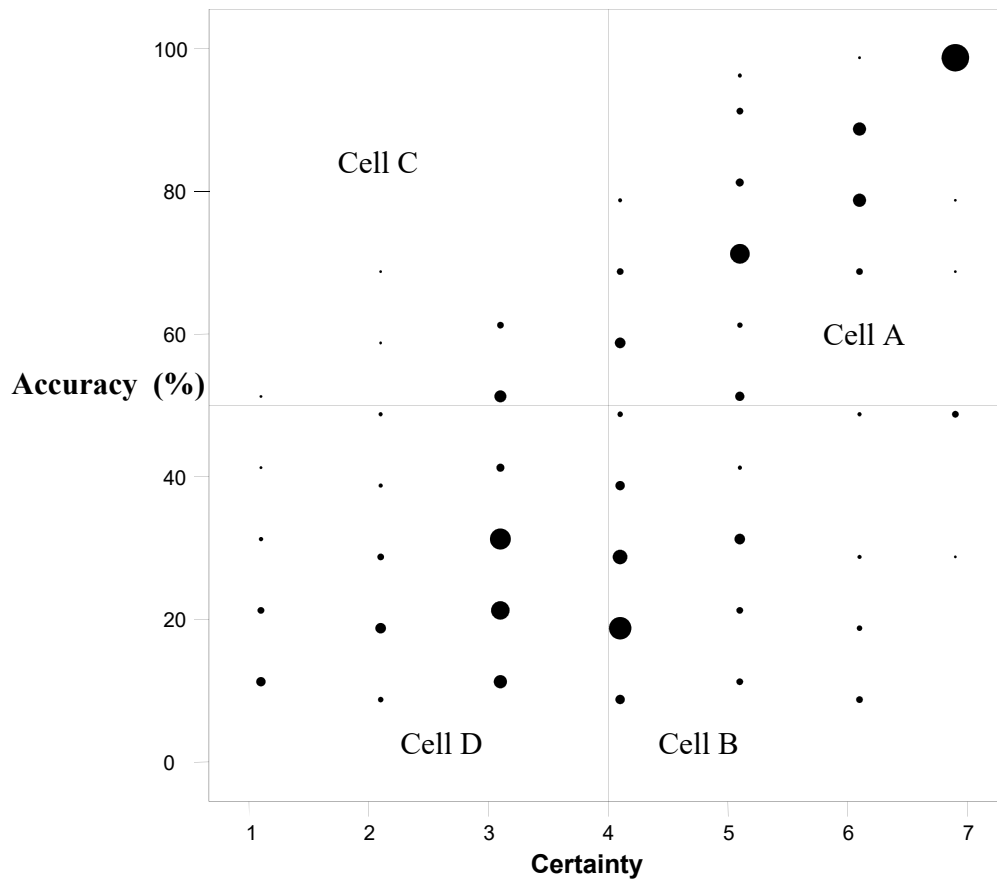


FIGURE 1
Accuracy/Uncertainty Matrix
 (Circle size indicates frequency.)

Dependent Variable: Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power(a)
Corrected Model	13.310(b)	10	1.331	1.607	.105	.065	16.072	.775
Intercept	760.112	1	760.112	917.864	.000	.799	917.864	1.000
SeniorDependence	2.160	1	2.160	2.608	.108	.011	2.608	.363
StateProb	12.371	9	1.375	1.660	.100	.061	14.939	.759
Error	191.298	231	.828					
Total	5240.794	242						
Corrected Total	204.608	241						

a. Computed using alpha = .05

b. R Squared = .065 (Adjusted R Squared = .025)

TABLE 3
ANCOVA Results

Strategic Importance		StateProb	StateUncert
A (<25%)	Mean	.460	4.16
	N	107	107
	Std. Deviation	.3114	1.689
B (25% - 50%)	Mean	.430	4.13
	N	104	104
	Std. Deviation	.2676	1.492
C (50% - 75%)	Mean	.573	4.72
	N	40	40
	Std. Deviation	.2611	1.710
D (>75%)	Mean	.533	5.67
	N	3	3
	Std. Deviation	.4509	2.309
Total	Mean	.466	4.25
	N	254	254
	Std. Deviation	.2904	1.632

TABLE 4
Strategic Importance and Accuracy

