

**PERCEPTUAL ACCURACY, KNOWLEDGE CALIBRATION AND
PERFORMANCE IN THE CONTEXT OF ENVIRONMENTAL ISSUES**

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Research Note

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ABSTRACT

There is growing evidence that managers perceive the environment inaccurately and may not be aware of this inaccuracy, something referred to as knowledge (mis-)calibration. The performance implications of both inaccurate perceptions and lack of calibration remain largely unknown. Using survey data this paper reports high levels of perceptual error and some degree of overconfidence in the context of a single environmental issue. It is found that accurate perceptions are associated with performance. This paper tests whether strategic issue importance, as measured by resource dependency, influences this association but only limited evidence is found to support this. Knowledge calibration is not found to be associated with performance.

Keywords: knowledge calibration; perception; cognition

INTRODUCTION

Executives can be considered 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 thus either implicitly or explicitly assumed by many scholars that a greater match between managerial perceptions of the environment and actual environmental characteristics leads to higher performance (Bourgeois, 1985; Sutcliffe, 1994). This view is increasingly being challenged for a number of reasons. Firstly, 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). Secondly, the relatively few empirical studies that have examined the link between accurate managerial perceptions and performance have produced mixed results. The literature on managerial forecasting (i.e. predictive) inaccuracies in particular is sparse (Walsh, 1995).

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 the environment may be more likely to fail. The implications for management researchers are equally serious. Management scholars often rely on data gathered by interviewing or surveying managers, and the implications of ubiquitous perceptual errors are that datasets used to create and test new management theory may in fact be at best biased, at worst unfit for purpose (Mezias and Starbuck, 2003).

A related question that has received very little attention in management research is whether managers are aware of their 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). 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, in particular any performance effects.

A number of studies have examined individual and organizational level determinants of perceptual accuracy among executives (Sutcliffe, 1994), or offered possible explanations for reported inaccuracies (Winter, 2003). What remain unclear are (a) the extent to which managers actually make such perceptual errors in the context of forecasting environmental issues or trends, (b) the extent to which they are overconfident in such a context, (c) the conditions under which perceptual errors matter, (d) the performance implications of perceptual errors, and (e) the performance implications of knowledge miscalibration. This paper attempts to answer these questions and to provide a possible explanation for the mixed results in the extant literature.

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). This paper thus suggests that the performance effects of the accuracy of an executive's perceptions of an environmental issue is 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. Some evidence is offered to support this line of investigation. Data from a survey of 254 managers suggests that whilst inaccurate predictions may be common, the problem of over-confidence, and of miscalibration in general, may not be quite as widespread as some researchers would have it (Pillai, 2010; Powell, Lovallo, and Caringal, 2006). Mixed evidence is found as to the association between perceptual accuracy and performance, indicating that accurate perceptions may not be directly 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

Perceptual Accuracy and Performance

Studies of executives comparing perceptual and objective measures of industry characteristics are surprisingly few and far between (Mezias and Starbuck, 2003; Starbuck and Mezias, 1996; Sutcliffe, 1994). Such studies 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.

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, 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) suggest, without testing, a variety of factors that in addition to objective environmental characteristics may explain how executives perceive the environment, including individual tolerance for ambiguity. Keats and Hitt (1988) examined 110 organizations using a somewhat novel approach to 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 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 executives' perceptual errors. Furthermore, these studies do not link such discrepancies to organizational performance.

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 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 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.

It can be concluded that despite growing evidence for cognitive inaccuracies, little and somewhat contradictory evidence exists regarding the performance implications of such inaccuracies. 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. Such questionnaires do more than ask executives to predict or estimate states of the environment, they also ask for interpretations about that environment, thus making it difficult to conclude that inaccuracies are attributable to misperceptions *per se* (Starbuck and Mezias, 1996).

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 the ubiquity of 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 paper 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. Calibration occurs when the executive's belief in the veracity of their perceptions (confidence) matches the correctness of those perceptions (accuracy) (Pillai, 2010). 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 proven 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. 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' knowledge is calibrated, we would therefore expect a majority of executives 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.

Hypothesis 2: Overconfidence in executive's 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. It is thus plausible that knowledge calibration is associated with higher performance and miscalibration 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). The hotel industry was chosen in order to limit the analysis to a single industry, which effectively eliminates 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, and given that this will objectively affect the Swiss hotel industry, using this particular environmental change to test the hypotheses should yield interesting and valuable results. 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).

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 paper formed part of a large 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 is 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.

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. This configuration is as predicted. Relatively few respondents exhibited unjustified lack of confidence (cell C), with a somewhat more significant number of respondents displaying some degree of overconfidence. This 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 some 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 definite support for hypothesis 1, although the results certainly do not require rejection of the hypothesis.

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. 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:

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

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. The data shows no significant correlation between miscalibration and the three measures of performance. A significant correlation (r^2 of 0.298) between uncertainty and miscalibration reveals that a higher degree of certainty is associated with higher levels of miscalibration. This is as expected and confirms what can visually be determined from figure 1. 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), 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 would perhaps be needed to validate their performance measures, given the lack of calibration. Thus, despite the lack of evidence in the data for an association between miscalibration and performance, we cannot firmly eliminate the possibility.

DISCUSSION AND CONCLUSION

The debate on perceptual accuracy 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 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 sense-making 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). Furthermore, it has 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 support the second camp as it adds only very limited evidence to support the proposition that accurate perceptions may be linked to higher organizational performance. Even the degree of knowledge calibration is not associated with performance in this study. 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. Clearly, more research is needed in this area if we are to advance our understanding of how accurate perceptions are linked to performance. What this study does clearly demonstrate is firstly that executives 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 knowledge calibration. Although executives are generally aware of the strength of their predictions there are clear cases of overconfidence.

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, accurate predictions and calibration today may lead to performance

benefits tomorrow. Testing this would require a longitudinal rather than cross-sectional study and represents an opportunity for further studies.

The implications of the results in this study are potentially serious. This study 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. 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 the problem.

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	Mean	Std. Deviation	N
Occupancy	59.53	15.054	245
Profitability	4.49	1.246	253
GeneralPerf	4.95	1.084	254
StateProb	.466	.2904	254
StateUncert	4.25	1.632	254

TABLE 1
Descriptive Statistics

	Occupancy	Profitability	GeneralPerf	StateProb	StateUncert
Occupancy	1	.473(**)	.385(**)	.109	.078
Profitability	.473(**)	1	.627(**)	.139(*)	.124(*)
GeneralPerf	.385(**)	.627(**)	1	.169(**)	.199(**)
StateProb	.109	.139(*)	.169(**)	1	.635(**)
StateUncert	.078	.124(*)	.199(**)	.635(**)	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

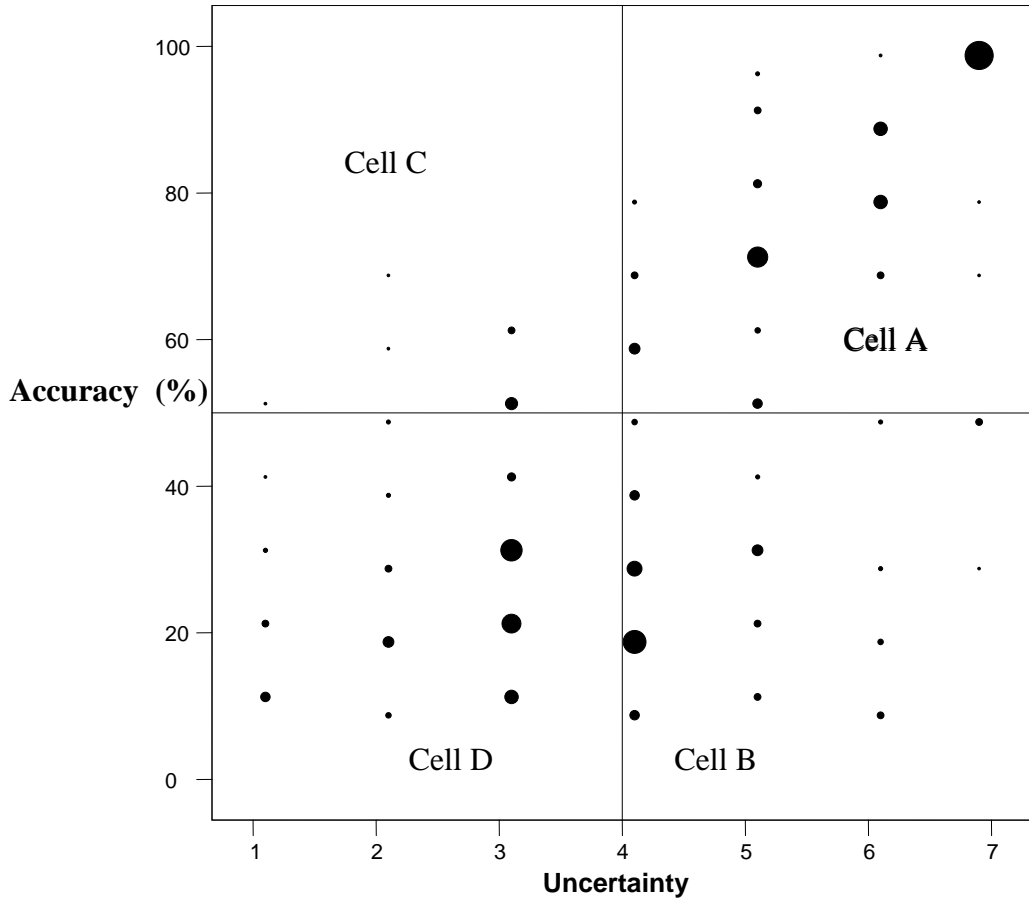


FIGURE 1
Accuracy/Uncertainty Matrix
 (Uncertainty is reverse-scaled. Circle size indicates frequency.)

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