

WHAT DOES YOUR GUT SAY AND SHOULD YOU LISTEN?
THE INTUITIVE-ANALYTICAL DECISION MAKING CONTINUUM IN MECHANIZED SKI GUIDING.

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ABSTRACT

Decision-making in avalanche terrain is a complex process. Professional guides have well developed strategies to help them navigate through the challenges. Years of training in analytical decision processes are supported by a wealth of available snowpack and weather information. Guiding teams are typical within the mechanized skiing industry and provide a valuable peer support network to further the sophistication of the decision process. However, within this mix the intuitive process begs further investigation. Despite the wealth of information provided by the InfoEx, most decisions are aided or influenced by an intuitive factor. This study addresses the issue of how and when intuition plays a role in ski guide decision-making.

1. INTRODUCTION

Ski guides are charged with the role of conducting guests through a constantly changing, hazardous, wilderness environment with the goal of maximizing the guests' rewards (deep powder skiing) within a risk envelope that does not eliminate the potential for a fatality (Bruns, 1996)(CMH, 2007). The decision process is governed by the level of expertise generated through the depth and breadth of experiences. Rapid pattern recognition comes from these many and varied experiences and can generate a sense of confidence. However misleading environmental feedback can complicate the perception of decision quality. When nothing bad happens, poor decisions can masquerade as good ones. This notion of non-event feedback has the potential to support the development of a faulty pattern recognition process with a corresponding negative effect on the quality of the intuitive response. Questions have been asked such as: why can a deliberate analytical thought process be discarded at the last minute in favour of a sudden intuitive feeling, or how can a strong intuitive feeling, which promotes a sense of complete confidence be so radically wrong?

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2. LITERATURE REVIEW

2.1 Judgment and Decision Making – A Two-System Process of Decision Making

Much has been written about the risk management or risk control decision-making process, largely coming from the field of psychology. The most widely recognized term for this body of knowledge is judgment and decision-making (JDM). However many different fields have a deep-seated interest in how decisions are made. Although there is some debate over it within the JDM literature, it is generally accepted that decision-making includes two processes, one analytical and one intuitive. These are not mutually exclusive events or processes. It is the interaction between these two processes that generates considerable interest.

The interaction between intuitive and analytical processes is **Error! Bookmark not defined.**one of the key elements of decision-making (Kahneman & Tversky, 1973). It is useful to consider this as a continuum, as decisions can be fully analytical, fully intuitive or a mix somewhere in between (Hammond, 1993; Hogarth, 1980). Gigerenzer (1996) describes a variation on this theme with what he terms, fast and frugal heuristics. In environments with high levels of uncertainty, the analysis of too much information may lead to less accurate predictions than a fast and frugal heuristic termed Take the Best (TTB). This approach focuses on two or three key indicators compared to the more complex and analytical Lens model proposed by Brunswik (1955), which relies on the weighting of multiple cues. Small errors in multiple cues may generate an inflated error in the final decision. Small levels of uncertainty in only two or

three cues may be more accurate. The Fast and Frugal decision tree is really just a simple rule-based decision using the two or three most important cues. It is different from intuition. However, once a Fast and Frugal heuristic (decision tree) is learned, it can become a pattern to be recognized and subsequently integrated into an intuitive response.

It is generally accepted that there is a link between decision-making and expertise (Ericsson, 1996). The concept of expertise and how its development affects the use of the intuition-analytical continuum can be applied to the context of avalanche risk management. A key element within the definition of expertise is the role that feedback plays in improving decision accuracy. This leads to the development of domain specific expertise as demonstrated through improvements in intuition accuracy and expressions of confidence (Hogarth, 2008). However a counter to the validity of the intuitive argument is the overuse of heuristics and biases (Hall, 2002). The development of avalanche risk management expertise is contingent on the existence and use of a feedback pathway.

2.2 Feedback (Near Miss Occurrences and Good Days)

Hogarth (2008) argues that the critical element in the development of intuition is the quality and quantity of feedback. He describes feedback as being relevant or irrelevant, in relation to the seriousness of the consequences, which can be described as lenient or exacting. Intuition does not need to be all that precise when consequences are lenient. A general direction is sufficient. However, when consequences are exacting, there are significant consequences for minor errors. This will produce an environment that can be described at its extremes as either 'kind' or 'wicked'. A 'kind' environment will have relevant feedback and lenient consequences, compared to a 'wicked' environment, which will have irrelevant feedback and exacting consequences. This has particular significance to the decision-maker in avalanche terrain. The experience gained by expert ski guides will have been acquired in range of wicked and kind environments. Many decisions are made when there is the potential for catastrophic consequences and minimal, or irrelevant feedback is generated. The "cultural capital or the inventory of intuitions that guide behaviour" (Hogarth, 2008, p. 91) has the potential to be tainted by this lack of relevant feedback.

"Experts are also surprisingly bad at what social scientists call "calibrating" their judgments. If your judgments are well calibrated, then you have a sense of how likely it is that your judgment is correct. But experts are much like normal people: they routinely overestimate the likelihood that they're right." (Surowiecki p.33)

One of the challenges is the interpretation of feedback from a previous decision, particularly when the feedback was minimal. For example: since the slope did not avalanche when I skied down it, the decision to ski the slope must have been a good one. This line of thinking may be flawed due to over-reliance on the feedback inherent within the activity, rather than incorporating a reflective component (Jamieson, 2006; Schön, 1990). The 'mere-exposure effect' suggests that "unless a stimulus is perceived negatively, repeated exposure is seen as positive and increases affect through repeated experience" (Hogarth, 2008, p. 97). Good decision-making is likely anchored by the notion of mindfulness (Weick, 2001). This pre-occupation with the anticipation of the unexpected rather than a satisfaction with previous performance is perhaps what separates good decision-makers from lucky ones and will help to address the issue of variable quality feedback (Hogarth, 2008; Wiseman, 2003).

3. METHODS

A testing out research strategy was used to find the limits of previous generalizations made in other fields. The Judgment and Decision Making literature, particularly the theories generated by the heuristics and biases researchers and the naturalistic decision making researchers, was used to analyze whether the ski guiding environment was any different from other risk-based decision environments.

Mixed methods were used to analyze three data sources:

1. A web-based questionnaire on background experience, was completed by each participant,
2. A web-based questionnaire, which allowed for multiple event reports of both good days and near miss days, and
3. Interviews and focus groups.

The data were contributed over two seasons, 2008/2009 and 2009/2010 by a self-selected group of 32 heli and snowcat guides working in British

Columbia. An initial quantitative analysis of the participants' background experience and 89 event reports (57 good day reports and 32 near miss reports) was used to provoke questions of the qualitative data from the interviews and the descriptive prose within the event reports. Some participants were more prolific in their event reporting than others. The highest number of reports from a single individual was nineteen and the lowest was one. The average of each individual's report(s) created a single set of data points. These averaged individuals were then combined to generate group averages and annual averages.

Although the quantitative data was generated from arguably a statistically marginal number of research participants and reports, its analysis provided cues from which to query the qualitative data. Valuable insight was gained through this two-stage analysis. A number of trends were evident within the quantitative data, which although not in themselves statistically significant, prompted further questions of the interview responses and descriptive questionnaire responses.

4. RESULTS

4.1 Background Experience Questionnaire – Rating the Expertise

4.1.1 The Research Participants - Expert Decision Makers

The 32 participants who contributed to my data collection represent a range of upper end expertise. Combining their number of work hours with their CPD hours produced an estimated average of 9,600 hours, close to the 10,000 hours commonly used as a benchmark for defining an expert. However, the data set does not include the number of recreational hours spent in avalanche terrain. Likely, this would add significantly to most if not all the participants' totals.

However, it is important to recognize that ten years of experience does not make an expert. Experiences can be empty or full, with full experiences maximizing the learning potential inherent within a given situation. The top levels of performance are not attributed simply to years of experience, but more so to years of deliberate and intense practice aimed at continual improvement. "Experience by itself is no guarantee of expertise, since all too often people have the same experience over and over and do little to elaborate those repetitions" (Weick, 2001, p. 16). Vick (2002,

p. 324) argues that expertise is dependent on two integral elements: the size of the knowledge base and the speed at which it can be accessed. This can also be defined as pattern recognition.

4.1.2 The Development of Expertise

Participating guides were trained and certified by one or both of the Canadian guiding associations, the Association of Canadian Mountain Guides (ACMG) and the Canadian Ski Guides Association (CSGA). As each certifying process is linked to a specific experience building process, there is a variety of expertise generated. Although there is some crossover, once a candidate starts down one certification path, there is a tendency to remain with that association. Cross-fertilization of ideas and methods occurs as experience develops. Guides from the two associations work together at many, but certainly not all of the mechanized ski operators. Within my participant group, there were seven IFMGA guides, nine ACMG Ski guides and six CSGA Level 3 guides. This is fairly representative of the upper end of the expertise scale. Twenty-three of the participants had completed the CAA Level 2 certification.

4.1.3 Breadth vs. Depth of Expertise

Guides who work in a variety of different locations early in their careers may develop more extensive adaptive expertise (Inagaki & Miyake, 2007; Tozer, Fazey, & Fazey, 2007). This may enable them to more easily adapt their expertise to a novel situation than a guide who has only worked at a single operation. The ability to respond to unfamiliar challenges and problems will be largely dependent on these adaptive skills, and recognizing what is different. Recognizing that there is a range of expertise, the adaptive expert will sit at the higher end of the continuum (Tozer, Fazey, & Fazey, 2007). The difference between the adaptive expert and the routine expert is that although expertise is domain specific in its acquisition, the application of expert knowledge can be extracted from its original learned situation and used in a novel way (Hatano & Inagaki, 1993, p. 117). Van der Heijden (2001) uses the term 'flexpert' to describe a person who has a high level of expertise and is able to flexibly apply it in a variety of novel situations.

4.2 Good Day and Near Miss Reports

Key outcomes from the quantitative data centered on how intuition and analysis were used and the subsequent impact on decision confidence. Stability was listed as the most significant

challenge in both seasons and for both near misses and good days. Yet an analysis of the rated stability for each of the report days showed little difference between good days and near misses. The Canadian stability rating scale was used with ratings for three elevation bands: Alpine, Treeline and Below Treeline. Using a scale from 1-5, with 1 = Very Poor and 5 = Very Good, the three elevation ratings were averaged.

Season	Stability	Reports	Reports w/ a PWL	Reports w/ Sa Sc
0809 GD	3.2	29	11	9
0809 NM	3.1	23	15	11
0910 GD	3.2	29	24	20
0910 NM	2.9	9	4	4

4.2.1 Intuitive Analytical Continuum

Looking at the interplay between intuition and analysis, using a five part scale ranging from fully intuitive to fully analytical, no decisions were described as being fully analytical. All decisions involve some level of intuition, with four decisions described as fully intuitive. The average was 2.81 or slightly on the intuitive side of an even mix of the two strategies.

Across a wide range of Judgment and Decision Making literature, there is support for the notion that as expertise develops there is a corresponding increase in the ability to generate a more sophisticated and nuanced intuitive response (Benner, 1984; Dreyfus, 2004; Easen & Wilcockson, 1996; Hogarth, 2008; King, 2002). The pattern of increased intuition use by the participants generally followed an increased level of expertise. The two participants with the most years of experience tended to be intuitive in their approach to decision making, while the two participants with the least number of years experience had the highest levels of analytical behaviour. However, there were exceptions observed. The participants within the mid-range of experience were scattered across the range of the intuitive analytical continuum. This may be due to the challenge of calculating expertise. The general parameter used is simply the number of years of experience. However a more nuanced measurement looking at a combination of: years of experience, number of locations worked at, engagement in continued professional

development, and a desire to excel, may provide some explanation.

4.2.2 Decision Confidence

The participants rated pre and post event decision confidence. The average expression of confidence was 80-89%. Although there might be guest or corporate expectations of guides to be correct all the time, it displays a high level of honesty in the participants' contributions. The participants described a decision environment fraught with variables that did not match previous patterns. Comments from the participants included statements about the surprise they experienced when avalanches occurred on low angle terrain and or deeper that they had expected. This fits with Hogarth's (2008) description of the "wicked" environment. The subsequent effect of these persistent weak layers was a reduction of decision confidence. The level of uncertainty and the consequence of releasing a deep avalanche contributed to reduction in decision confidence. As the difficulty of predicting the sensitivity of a Persistent Weak Layer (PWL) may have caused higher levels of anxiety and stress, what is remarkable is the safety record of the mechanized ski industry.

4.2.3 Near Miss Reflections

Accuracy in decision-making benefits from the feedback received through the making errors and recognizing that these errors have occurred. Near Misses are golden opportunities to learn from the decision environment. Weick (2001) suggests that when the number of perceived errors is low, there is minimal opportunity to learn. It is only once the errors are detected that feedback can be elicited. Errors, which are not perceived or recognized as such, may actually lead to a 'false positive'. For example, the decision to ski a particular slope will likely be considered valid when the result does not include a negative result such as an avalanche (Gonzales, 2008). The adjustment to these detected errors increases the quality of the decision-making. "The commission of errors *per se* is not necessarily a problem. We need to consider the consequences of errors not just the reasoning processes" (Lipshitz, Klein, Orasanu, & Salas, 2001, p. 340). Working towards an error-free performance in a highly complex unstable environment may in the long run be detrimental to the learning process.

When asked to reflect whether anything could be learned from a near miss event, participants

provided the following responses. These responses have been categorized according to themes, which emerged in the quantitative data.

Snowpack

'It is ironic that with the extreme caution used this season with the deeper instability, it was a surface instability that 'spoke out''

"Always learning. Surprised with the extent of propagation and fracture depth."

"Mid-slope stability tests require added care and attention in how and where, especially at slope breaks."

Terrain

"Continue to space out skiers in suspect terrain / stability."

"Pick easier terrain at the end of the day and slow down the pace."

"To never underestimate terrain and what can occur on what kind of terrain. To never let your guard down in an uncharacteristically poor stability snowpack and to always move from safe spot to safe spot and giving that safe spot more leeway."

Guests

"Better group control & better communication, and if the group is not receptive, back off until they are."

"Forget about the pressure from the guests to ski more, always more."

"Never over estimate guests skills."

"The guests get what they get. I should never pressure myself in skiing certain slopes just to please them."

Guides

"That no matter what, when you think the situation is worth speaking up about, it is better to do it strongly regardless of your peer guides feelings."

4.3 Interviews

Participants described the intuitive analytical relationship.

"Just looking at the terrain was enough to promote an intuitive response. It is highly unlikely that I will go in there."

"More detailed knowledge of the terrain allows for a more intuitive response. New terrain promotes the desire for a more analytical response."

"I had a lack of confidence in the analytical process with a weird winter. I was becoming more intuitive because the analytical process was less trustworthy."

"It is good to get a client caught in an avalanche because it brings back the reality of the consequences. A stronger intuitive response is built as a result. See it feel it and be part of it. Particularly if you have been part of the decision involved in that happening. It's that negative feedback – I made a decision and it was wrong, way wrong because somebody got caught, those decisions really sink in."

5. DISCUSSION

The two seasons of data collection (2008/2009 and 2009/2010) were plagued with snowpacks characterized by persistent weak layers. This presented more complex decision-making challenges than what might be considered in "normal" winters. Most of the participants would have experienced three seasons in a row of having to make decisions regarding persistent weak layers, as 2007/2008 was of a similar nature. Perhaps an increased level of pattern recognition is being developed regarding this phenomenon by Canadian avalanche professionals.

The level of engagement of the participants can be seen in the degree of openness and honesty in the answers to both the questionnaires and the interviews. Participants expressed their thought processes with an openness that might concern corporate marketing managers. Discussions of the level of confidence they had prior to committing to a ski line and the potential role that luck played in the outcome revealed much about the professional ski guide decision process. There was a willingness to say, "sometimes I just do not know".

A theme that emerged from the interviews, focused on decision avoidance through the management of terrain and the avoidance of areas. Rather than feeling forced into making a decision about what is safe to ski, terrain was chosen to avoid the hazard. The decision was avoided completely by choosing alternate terrain. Participants made life easier on themselves in terms of the decision process by choosing to not use certain terrain.

Ski guides are trained in the decision process at each step in the certification process. With three levels of avalanche training and four levels of guide training and certification representing a total of 50-60 days, there would appear to be ample opportunity to foster the development of a quality decision process. However when approach from the perspective of the intuitive-analytical decision continuum, more emphasis is placed on the development of analytical decision making within

the training courses curricula. This is likely because the analytical process is much easier to teach. The results from this study suggest that intuition plays a role in most decisions, so it may be beneficial to expand the training opportunities in this area.

Participants described the important role that peer feedback played in the development of their decision process. This is an area that the classic mechanized guiding team approach has the opportunity to excel at. A small group of guides can help each other become better decision makers by improving the quality and quantity of feedback, particularly when it comes to the role that intuition plays.

6. CONCLUSION

Intuition plays a role in much of the decision-making ski guides are asked to do. The analytical aspect of the decision process is well supported through the training process and ongoing research. More can be done to help guides understand and efficiently use their intuition.

For intuition to work well, there are two conditions, which must be met: the environment must give consistent valid cues as to the nature of the situation, and at some point the decision maker must have had the opportunity to learn the meaning of the cues. If the cues are not present or the decision maker has not learned the implications of the cues, an intuition response, which leads to a good outcome, can only be attributed to luck. In the words of one participant, *"Intuition is based on a series of events. Intuition has to be based on experience, if it is not it is luck."*

Ski guides may build expertise that is "fractionated", as they have well developed intuitions in some areas, but have gaps in other areas. The application of expert intuition from one situation to a novel situation may create high levels of subjective confidence that is not well founded in the underlying expertise base of skills. This may create an illusion of competence that leads to overconfidence. Klein (1993) suggests that environments, which pose direct personal hazard, perhaps like that, which a ski guide operates in, may reduce the incidence of overconfidence. The ski guide needs a fine sense of the limits of his or her expertise due to the severity of potential consequences. In the words of one of the participants reflecting on a near miss...

"The event occurred towards the end of the day and, in hindsight, I should have picked a mellow run. It was a fine line between providing them with exciting runs and scaring them in a near-miss avalanche. I think I'd rather ride the side of keeping it mellow and bringing everyone home, even if they feel that the runs were too mellow. Most guest over estimate their abilities and energy levels (especially at the end of the day). Part of me wanted to send them home with a great and exciting last run, when they probably would have been happy with another, less committing line."

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