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*Answering*

# **18 Hot Questions**

*on*

## *Forecast & Foresight*

This document provides simple answers to 18 hot questions on forecast and foresight and may be helpful for the students of Futures Studies who are going to accomplish their foresight assignments and missions successfully and effectively.

*Answering*  
**18 Hot Questions**  
*on*  
**Forecast & Foresight**

**By: Alireza Hejazi**

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## Foreword

Understanding the principles and applications of operational foresight (Bell, 1996) is an important task, but comprehending different conditions in organizations is more important (Morlidge & Player, 2010).

If we want to be called 'real futurists', we should be able to identify foresight terms and explain their operational relationship to budgeting, planning and marketing, and sales. Also, we should be able to recognize the contexts in which foresight occurs, whether operationally, strategically or socio-political-economics (Keenan, 2007).

In fact, we should decide when to use statistical or judgmental methods in strategic foresight, and know how to combine foresight methods to generate 10 to 20 year outlooks. We must be able to distinguish forecast techniques and foresight methods from each other, including Delphi survey, trend impact, cross-impact, decision modeling, technology sequence, technology roadmaps, relevance tree, normative futures, text mining, multiple perspectives, and causal layered analysis (Glenn & Gordon, 2009).

In this way, we can explain when quantitative versus qualitative forecasting techniques should be used, and the advantages and disadvantages of each. We should afford to select and use an optimal combination of foresight methods when presented with a future problem.

This introductory document provides a discussion on the choices that managers and analysts face in regards to selecting forecast techniques and foresight methods. We should be able to identify the techniques, explain various ways that methods can be grouped in, and offer guidelines that strategic managers can use to combine methods to solve problems and frame out foresight studies without bias.

I've focused on specific quantitative and qualitative futures research methods that Glenn & Gordon have already covered in their *Futures Research Methodology V3.0*. As a student of Strategic Foresight, I've strived to answer main questions so that they may be captured quickly by students like myself. However, in your follow-up studies, you may consider how these methods might apply to your area of specialization.

Up to 18 questions are raised and answered in this document. The first ten questions are dedicated to forecast and the latter address foresight challenges. As a student or professor of Futures Studies or even a commentator your ideas and points of view are highly appreciated.

*Alireza Hejazi*

*October 28<sup>th</sup> 2011*

# Part 1

# Forecast Profile

### **Forecast or Foresight?**

As we develop our professional conceptual frameworks, we should have distinctive understanding from concepts we learn. We should remember that “forecasting” is predicting that an event will happen, to a defined extent, and sometimes with a defined probability (Aud Dia). Forecasts are usually applied to short-term futures - no more than a few years ahead. A forecast is considered to be less certain than prediction, but more certain than conjecture or anticipation. “Foresight” is a broad term covering all methods of envisaging the future, but with an emphasis on the alternative futures concept. However, forecasting is not normally included as a part of foresight (Cornish, 2004).

### **Normative or Exploratory?**

In learning “Forecasting Techniques,” we should immerse ourselves first in the field of operational business forecasting (Jain & Malehorn, 2005), before learning strategic forecasting with 10 or 20 year outlooks. This helps us grasp quantitative forecasting methods, including time series extrapolation, exponential smoothing and regression analysis, before tackling the judgmental aspects of long term strategic forecasting, which requires discernment to separate baseline and alternative futures (Gary, 2010). Meanwhile, building up our foresight knowledge, we need more to grasp essential concepts in a distinctive manner. We should be able to make clear differentiation between similar concepts.

Normative forecasting addresses the question of “what ought we to do.” Normative forecasting is usually associated with large organizations, both public and private, as an important component of decision making and a factor in resource allocation (Coates and Glenn, 2009).

Many techniques—such as scenarios, Delphi, various forms of expert group meetings or interviews—tend to be used in both normative and exploratory formats. More genius forecasting and greater use of science fiction also appears in normative forecasting than in exploratory forecasting.

According to Coates and Glenn (2009), an “exploratory forecast” generally moves forward into the future in terms of forces at play. Exploratory forecasting reflects a continuity model of the future, i.e., a clear linkage between the forces at play and their effects on the components of the system under study. Hence, the objective in the exploratory forecast is to examine the various ways in which those forces and components may play out.

Normative forecasting, in contrast, jumps ahead and states some goal or objective that may be substantially or only apparently discontinuous with the trends currently at play. Then, having defined that future goal, the forecaster backs away from that future to the present to identify the necessary steps for reaching the goal.

### **What Are the Basic Steps of a Predictive Enterprise?**

Georgoff and Murdick (1986) have offered four main kinds of forecasting methods, including: judgment, counting, time series, and association or causal based on these considerations: time horizon, technical sophistication, cost, data availability, variability and consistency of data. They have also considered three kinds of forecasting strategies: deterministic, symptomatic, and systematic.

Meanwhile, Kiely (2002) takes two levels of global and country levels of sales forecasting. Kiely has considered two kinds of forecasts: tactical and strategic. Usually, the short term forecasting process is focused on tactical forecasts for products that have already been launched and have sales history. On the other hand, a long term strategic forecasting process is focused on new products with little or no sales history.

Short term tactical forecasts are developed from bottom-up and middle out approaches. Top down approaches are used for products that are just a few months from the launch. Middle out approaches are used for new products that are 6-12 months from the launch.

In addition to aforementioned techniques and practices, it's good to remember five basic steps of a predictive enterprise (Noonan, 2005) as following:

- Understanding where we are today;
- Putting our data to work to gain insight and foresight;
- Planning improvements that affect revenues, costs, and/or other outcomes;
- Deploying those improvements; and
- Measuring the results;

This was just a summary of what we should know and apply in our studies concerning the operational forecasting and there are many other elements and factors that should be learned, remembered and applied into our forecasting business.

### Future “Aligning” or Future “Influencing”?

We are usually proudly busy with forecasts that we’ve made and proved as true and valid, but what about untrue or false ones? Forecast errors are instructive. We aim to learn from our and other people’s mistakes in order to establish filtering criteria for good forecasts and to be able to critically assess each forecast and to be able to extract what value there is, if any.

We should remember that a forecast is not good if it predicts the future correctly; it is good if it better prepares us for a future that is inherently uncertain. Gordon in Chapter 7 of *Future Savvy* develops issues related to complexity and considers how all elements of the world are interconnected so that changing one element changes everything else—often in unpredictable ways.

Gordon’s view on the concept of “*alternative futures*” can be summarized in this manner:

Acknowledging the unfathomable complexity of human and natural systems, and our inability to know or compute all the variables no matter how hard we try, this approach instead adopts the concept of “*multiple futures*” or “*alternative futures*”, and aims merely to identify the spread of possible and probable outcomes, without vouching for any one. Alternative futures may even be seen as a “cop-out”—the last refuge of forecasters who know they are going to get it wrong anyway.

However, forecast intention can be seen in forecast period (length of time); fixed point prediction versus willingness to develop multiple possible outcomes; overall author orientation toward optimistic versus pessimistic outcomes; and intention to either *align* with or *influence* the future. Everybody is an “influencer”; the problem is making them aware of that fact, and enabling them to act on it (Pang, 2010).

“*Future-aligners*” aim to work on themselves to be ready for the future, while “*future-influencers*” aim to work on the world. Lombardo reminds us that “without self-responsibility, one sees oneself as a victim and incapable of influencing the future.” (Lombardo, 2010). To achieve “*future fit*” we use forecasts to position ourselves and our organizations, creating (or renewing) the fit between our initiatives and environment. The better a manager’s view of the future, the better his decisions will turn out to be.

A golden key to forecasting in Gordon’s view is that “a future different from today implies that forces of change will have overcome blocking forces, and a good forecast will adequately explain how a shift in the balance of power between drivers and blockers supports the prediction.”

It is up to us whether choose to become a future-aligner or a future-influencer, but it’s clear that a real forecast prepares us for taking some sort of “action” and in this sense we have to become an influencer.

### **Why the Validity and Quality of Data Are So Important?**

Forecast is a data-based activity (Gordon, 2008). Although the numbers are not everything in forecasting and we should also have an eye on qualitative attributes of our forecasts, the quality of data we use has an important role in outcomes we achieve after conducting a forecast project.

According to Gordon (2008), there are a number of specific issues that can undermine the quality and reliability of data. They include:

- Data from secondary sources instead of primary sources;
- Out-of-date data;
- “Future” data that has been projected from the past;
- Non-representative samples;
- Data based on questionable definitions;
- Surveys that can be skewed by the form of the questions;
- Hidden numbers that can change the conclusions of the forecast;
- General proficiency in math and the manipulation of numbers.

Meanwhile, we should use primary data as far as possible. In fact, “the best data is primary data—data researched and presented by the original researcher—and the best use is primary use.” However, we should remember that most of forecasters rarely use primary data. In this case, where a source is cited, the forecaster commonly just relies on its reputation in determining whether due process has been applied in data acquisition and verification and asks the forecast consumer to rely on this reputation in the same way.

How can we become sure about the validity and quality of secondary data we use, especially when we cannot produce primary data by the means we have in our hands? Can the reputation of data provider be really a secure criterion? Think about these questions and evaluate your response by digging more and experience you gradually find in your area of specialization.

### **How to Choose a Forecasting Technique?**

Given that there are four main kinds of forecasting methods: judgment, counting, time series, and association or causal (Georgoff and Murdick 1986), the choice of a forecasting

technique is significantly influenced by the stage of the product life cycle, and sometimes by the firm or industry for which a decision is being made.

After evaluating the particular stages of the product, and firm and industry life cycles, a further probe is necessary. Instead of selecting a forecasting technique by using whatever seems applicable, decision makers should determine what is appropriate. Some of the techniques are quite simple and rather inexpensive to develop and use, whereas others are extremely complex, require significant amounts of time to develop, and may be quite expensive. Some are best suited for short-term projections, whereas others are better prepared for intermediate- or long-term forecasts.

What technique or techniques to select depends on the following criteria:

1. What is the cost associated with developing the forecasting model compared with potential gains resulting from its use? The choice is one of benefit-cost trade-off.
2. How complicated are the relationships that are being forecasted?
3. Is it for short-run or long-run purposes?
4. How much accuracy is desired?
5. Is there a minimum tolerance level of errors?
6. How much data are available? Techniques vary in the amount of data they require.

We should remember that after the product has entered the maturity stage, the decisions are more routine, involving marketing and manufacturing.

### **What Is Genius Forecasting?**

All of us have an imagination, but futurists use intuition and vision in their work. According to Glenn and Gordon (2009), genius forecasting is an unspecified set of processes used by geniuses to arrive at statements about the future. They believe that genius forecasting, intuition and visioning are all connected with somehow foreseeing and visualizing futures. The value of intuition as a source of knowledge has been proven for the philosophers throughout history. However, genius forecasts can also come from people whose IQ is less than genius, but who have proven to have great insight in some specialty.

Probably the best source of diverse genius forecasting is science fiction literature. Michel Godet writes that, "Intuition is the lightning flash which springs from the right brain through the synthesis of information and analysis stored in the left brain..." (Godet, 1993). These activities of the mind are *pre-rational* rather than *irrational* activities of the mind in

that the insight, Platonic Flash, futuristic vision, etc., are not rationalized at the moment of cognition, even though they evolved from much rational thought and memory of experience (Levinson, 1988). Intuition can be thought of then as the bridge between the known and the unknown.

We remember that one of the founders of futures studies in the Netherlands was Fred Polak whose book *The Image of the Future* stressed the importance of images of the future and states that, “[We are] citizens of two worlds: the present and the imagined. Out of this antithesis the future is born.” (Polak, 1973).

A variety of sources exist to find geniuses and their insight:

### ***How to Find Those with Insight***

- Prediction Markets
- Search literature and Internet
- Referrals from wise ones
- Recommendations from institutions, organizations, and directories
- Observations at conferences and other gatherings of creative people
- Hold contests for genius forecasting and vision
- Follow current events
- Access public Delphis through newspapers, radio, and/or television.

### ***How to Stimulate Your Own Insight***

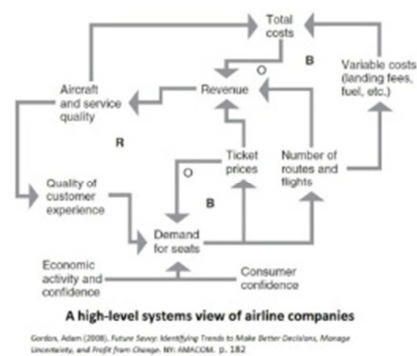
- Reading diverse material
- Feedback on *guessing journal*
- Doing opposite of the usual
- Participating in simulations and games
- Solitary and guided meditation and visioning exercises
- Perceptual exercises, dreams, feelysis, and thought experiments
- Extradimensionality (mental and physical alterations from norm)
- Interning with those of great insight and vision
- Futurist methods.

### **What is the Systems Approach in Forecasting?**

The systems approach is commonly used for social and economic situations. In this sense, structure is modeled by identifying variables as “stocks,” that is *quantities* that can go up or down, and linking them via links or “flows” to show the up-or-down effect of one on another (Gordon, 2008).

There are two kinds of effect. Either two connected variables move in the same direction or are connected in opposite directions, that is, one variable going up causes the linked variable to fall (or a fall in one leads to a rise in the other). In the first case, for example, a rise in factory emissions causes atmospheric CO2 levels to rise. In the second case, for instance, raising prison sentences for drug pushers causes the supply of drugs to fall, which raises the price, which makes them more attractive to farm and produce.

Meanwhile, a reinforcing loop may also occur. Where change in one variable affects others in a loop such that the chain of causality returns to affect the original variable in the same direction, we are faced with a reinforcing loop. For example, when an organization is losing money may cut corners on product quality, which leads to inferior products, that leads to customer dissatisfaction, which leads to customers switching to a competitor's product, which leads to the company's losing more money, which leads the company to further cut corners on product quality, and so on.



It is noteworthy that there are also other loops such as “balancing” loop that is one where the system responds in the opposite direction to the initial change—which feeds back to dampen or nullify the initial change. In this way, each variable in a system will have many variables affecting it, and it in turn may affect many others, so full system modeling becomes quite complex. The total picture that is represented with a systems diagram, is also known as a causal loop diagram, which shows many stocks, flows, and feedback loops. Gordon (2008) has offered a sample diagram for a high-level systems view of the situations airline companies (p. 182) that facilitates our understanding in this regard.

### Why Should We Take Wild Cards into Our Forecasting Account?

One of the professional aspects of our foresight practice is identifying Wild Cards in a realistic manner. Oliver (2011) has provided a much-needed conceptual breakthrough in the Wild Card realm. Futurists typically define Wild Card (a.k.a. STEEP surprise) as a plausible future event that is estimated to have low probability but high impact should it occur (Schultz, 2003). Oliver introduces what he calls a *Type II* Wild Card, which is defined as

having high probability and high impact as seen by experts if present trends continue, but low credibility for non-expert stakeholders of importance. The addition of credibility as a criterion makes a whole lot of sense. It helps explain how some things which seem obvious to futures (high probability and impact) can be seen as wildcards from the larger social perspective, because they have low or zero credibility.

Wild Cards are becoming important day by day, given the chaotic nature of our world today. We usually deal with Wild Cards in STEEP mode, but did you know that it goes deeper even into our personal futures? Verne Wheelwright (2010) who is a professional on personal futuring dedicated chapter 19 of his recent book *It's YOUR Future...Make it a Good One!* to illuminate the role of Wild Cards in changing our earlier personal forecasts.

In an interesting article (that I think should be read by every student of Strategic Foresight), Millett (2011) reiterates the important role of Wild Cards in his first principle of Futuring as an applied history "the future always has been and most likely always will be an unknown combination of both trend continuities and *discontinuities*."

Millet extends his view by reminding theories of subjective probabilities advocated by eighteenth-century English mathematician and theologian Thomas Bayes and by twentieth-century Italian statistician Bruno de Finetti that are very applicable today when we assign likelihood to any future conditions or outcomes. It's time to think beyond what we know about Wild Cards. At least, we should always take them into our forecasting account.

### **How to Address the "Wicked Problem"?**

Ready access to computer power, allowing us to do more with numbers, has greatly facilitated our forecasting job, but there are problems with quantitative forecasting (Gordon, 2008). All computer-driven quantitative modeling generates future projections through predictive algorithms, based on mathematical relationships between variables derived from analysis of past data. For instance, a regression can help determine what mix of causal factors in what proportion has caused this over time.

We know that using the standard measure of time as a base, analysts create a mathematical curve that approximates the data evolution to the present, sometimes using moving averages or other data-smoothing techniques.

However, according to Chaos theory analysts (Gordon, 2008), the so-called "butterfly effect" explains that small changes or chance events can lead to widely differing outcomes when fully played out, due to the unfathomable complexity of multiple and often reinforcing forces. This makes a real challenge for quantitative forecasting that is usually

based on linear prediction. Also, while chaotic situations do exhibit underlying patterns or perform in regular, predictable ways under certain conditions, under other conditions regularity and predictability is lost.

According to Gordon (2008), other ways of expressing irreducible complexity have also gained currency, for example, the concept of a “wicked problem,” proposed by Rittel and Webber to describe situations that have incomplete, ill-defined, or systemically contradictory interdependent variables (contrasted to “tame” problems where there is one clear solution even if it may be hard to find.) *There is no solution* to a wicked problem. Such a problem is solved, if it is solved at all, by acting on multiple fronts at once.

Hancock’s (2004) argument of “Tame, Messy and Wicked Risk Leadership” helps professionals understand the limitations of the present project and risk management techniques. It introduces the concepts of *societal benefit* and *behavioral risk*, and illustrates why risk has followed a particular path, developing from the basis of engineering, science and mathematics.

Hancock offers complimentary models from the worlds of sociology, philosophy and politics to be added to the risk toolbox, and provides a framework to understand which particular type of problem (tame, messy, wicked or messy and wicked) may confront us and which tools will provide the greatest potential for successful outcomes.

## **Part 2**

# **Foresight Profile**

## How to Choose Foresight Methods?

One of the great challenges that we will face in practicing our profession as the futurists is choosing and combining foresight methods in a reliable manner. How can we become sure that the methods we've chosen are really suitable for our studies?

Andrew Jackson (2005) has categorized the selection of foresight methods based on the objectives; the desired project outcomes; and the information needs of stakeholders.

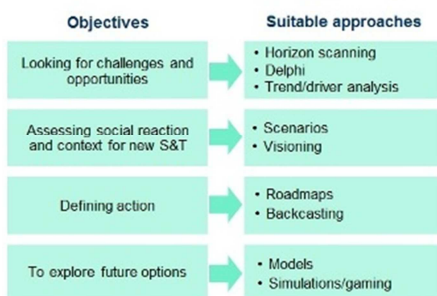
**Project's objectives:** The objectives are usually described in terms of questions the project is seeking to inform. Making sure that every stream of work reflects the project's questions makes it much easier to analyse the information at the end and reduces the risk of missing something important.

**Project's outcomes:** It is worth investing time with the project's team to consider our desired project outcomes. This will help to ensure that our futures approach is right and verify that we have not missed any key stakeholders we should be working with.

**Project's information needs:** The type of information we produce at the end needs to be of the type which will be useful for our stakeholders. For instance, if we are seeking to inform research funding organisations, a simulation of the future may be of little value.

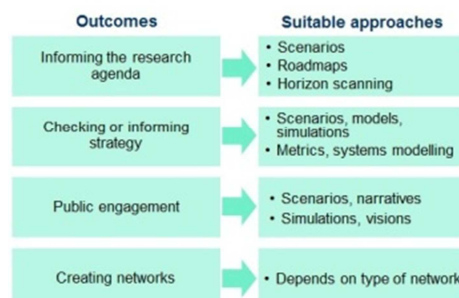
The following images suggest appropriate methods to match each of these categories. As the method that best suits our objectives might not be the same as the best method to achieve the right type of information, it is often worth using more than one foresight method.

### Matching futures approaches to objectives



Source: Jackson, A. (2005). Strategic Futures Planning: Suggestions for Success, [www.foresight.gov.uk](http://www.foresight.gov.uk)

### Matching futures approaches to outcomes



Source: Jackson, A. (2005). Strategic Futures Planning: Suggestions for Success, [www.foresight.gov.uk](http://www.foresight.gov.uk)

## Matching futures approaches to information needed

Type of information the stakeholder would find most useful

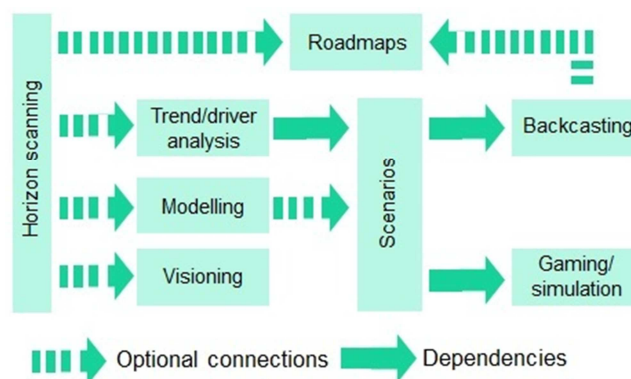
Futures approach	Evidence based	Good for stakeholder engagement	Metrics	Good for testing policy robustness	Good for spotting the unexpected	Provides a clear path forward
Horizon scanning	X		X		X	
Delphi	X	X			X	
Trend analysis	X		X			
Scenarios	X	X		X	X	
Visions					X	
Model	X		X	X		
Simulations	X	X		X		
Roadmaps	X	X				X
Backcasting		X				X

Source: Jackson, A. (2005). Strategic Futures Planning: Suggestions for Success, [www.foresight.gov.uk](http://www.foresight.gov.uk)

### How to Combine Foresight Methods?

I should admit that it is not possible to set out an easy process to decide how to combine futures approaches. We should always pick a selection of futures approaches that will be complementary and match the project’s objectives, desired outcomes and the information needs of the stakeholders.

Many futurists like Andrew Jackson (2005) suggest that it is good practice to use a number of foresight methods in a project. The diagram below sets out an example of how the different methods can relate to each other and the natural sequence for these techniques.



Jackson, A. (2005). Strategic Futures Planning: Suggestions for Success, [www.foresight.gov.uk](http://www.foresight.gov.uk)

In addition, Ian Miles (2008) reminds that methods like Brain Storming and Delphi have similarities and can be used together to assess goals and objectives. He has a clear categorization of 31 foresight method based on Popper's (2008) work as: quantitative, semi-quantitative and qualitative.

According to Miles (2008), selecting and combining foresight methods should be based on these criteria: (a) Available resources (time, money, expertise . . .); (b) Nature of desired participation; (c) Suitability for combination with other methods; (d) Desired outputs of a foresight exercise (e.g. product vs. processes); (e) Quantitative / Qualitative data requirements of methods; (f) Methodological competence (not just in consultants!) often a key factor. It is so similar to Keenan's (2007) criteria (because both of them work at Manchester Institute for Innovation Research).

### How to Deal with Different Foresight Styles?

Peter Bishop and Andy Hines (2007) are famous for fabricating their well-known (strategic) foresight style in 6 steps: "framing, scanning, forecasting, visioning, planning and acting".

Meanwhile, Ian Miles (2008) and Michael Keenan (2007) have introduced the concept of *foresight cycle* composed of five elements: "renewal, pre-foresight, recruitment, generation and action". They have founded their cycle based on: "management, evaluation, and monitoring". Their foresight methodology is shaped around Popper's (2008) diamond of foresight methods that has four corners: "creativity, expertise, evidence and interaction".

Miles (2008) has also offered valuable criteria in designing every kind of foresight style. Our foresight styles should be (and have):

1. Succinct, jargon-free, clear, unambiguous topic statements;
2. User-friendly and meaningful response options;
3. Sufficient information to analyse clusters/interdependencies.

In addition to aforementioned styles, Natalie Dian (2009) has identified six foresight styles at professional level: "futurist, activist, opportunist, flexist, equilibrist and reactionist" based on the roles that a futurist may find in his / her activities. It should be reminded that her work was mainly concentrated on the futurists' style of thinking or mindset.

However, Jackson (2005) reminds three important points in working with every kind of foresight style in this manner:

1. Your work will never be 100% accurate, even though you can build an evidence base for the work.

2. There is always a risk that it will simply confirm what you already know, highlight an issue about which you can do nothing, or produce an answer which you do not believe sufficiently to act upon.
3. Getting the balance right between looking ahead, developing a strategy and delivery is the key.

We should also remember that “evolution” is the nature of Futures Studies field and so the foresight styles.

### **What are the Frontiers of Foresight Methods?**

Another important point that we should carefully consider in our foresight practice is the territory and frontiers of foresight methods. In fact, it is a key consideration in selecting and combining the methods based on applications we are going to have in our studies.

Glenn and Gordon (2009) remind us the borders of 9 main foresight methods in this manner:

**Delphi** requires finding true experts to participate, encouraging continued participation throughout the rounds, rating the expertise of participants, directing particular questions to particular experts and integrating the method smoothly with other approaches requiring group judgments.

**Futures Wheel** involves adding the requirement that impacts be considered for a predetermined set of areas or domains to help assure that all important impact domains are considered.

**Trend Impact Analysis** method involves producing a “base line” of a variable, usually a simple extrapolation, based on a best fit of historical data to one of several linear equations.

**Cross-impact Analysis** focuses on interactions between pairs of events. Yet, in the real world, the important interactions may involve not only pairs but triplets and higher-order effects.

**Scenarios** have more flexibility and utility compared with other methods. Scenarios at international levels deal with derivation of global norms for normative scenarios using global panels, circulating draft scenarios with blanks and inviting an international panel to add their views.

**Simulation and Games** are growing in realism, scope and effectiveness as the digital tools and societal data bases improve and expand.

**Science and Technology Roadmapping** benefits from the spread of interoperability of online computer software; multiple remote users may help construct and pursue different applications of a roadmap using the networks as a data base.

**Text Mining** of Science & Technology Information Resources is most promising in terms of the advance in interpretable innovation indicators that benchmark technological progress.

And finally, **Personal Futures** was developed primarily to bring the benefits of futures methodology within the reach of individuals, to help those individuals become aware of their potential futures and to make plans and preparations for those futures.

By remembering these clear borders, we can make a vivid image of foresight conventional methods in our mind. Understanding the applications of each method helps us arrange our tools in our toolbox regularly and use them effectively. In this way, we can use them properly according to our goals in consulting, visioning and shaping preferred futures of stakeholders.

### **How to Reduce the Scope of the Unknowable?**

Most of the developments that characterize our lives were unexpected - omitted from futures research studies of the past. According to Glenn and Gordon (2009), this criticism applies to essentially all methods, from Delphi to econometrics, from scenarios to the futures wheel. For the most part our best methods miss developments that will later prove to be of greatest importance.

One logical approach is to review old forecasts to find out which forecasted events have occurred, which have not that may yet still, and for the courageous, what has happened that was the forecasted.

If we grade future developments in terms of their likely severity, lasting effects, irreversibility, numbers of people affected, and their ability to open new pathways to understanding and achievement, then these omissions were indeed significant.

A review of past studies suggests that there are two clear and distinct types of future developments. First there are developments which are anchored – weakly or strongly- in history. And second those which are not anchored in history at all: the class of unknown and unknowable future developments. (Taleb, 2008).

Most futures studies produce forecasts that are anchored in history. When experts are asked about future developments, they usually extrapolate from their experience. Causality is linear; history is the guide to the future. However, if developments are not

rooted in history, they are generally seen as implausible and are likely to be omitted from any forecast study.

Unknown and unknowable developments are not rooted in history, may well be sudden, non-linear, discontinuous, unscheduled, and unanticipated. In futures these are "wild cards" discovered in part through monitoring for "weak signals".

Much work remains in the field of decision making. We know that forecasting methods should not produce single-value images of the future and that uncertainty should be made explicit. Yet the tools for dealing with uncertainty, for ensuring adequate return for risk-taking, are far from perfect and, outside of market beta theory, rarely used.

Glenn and Gordon (2009) believe that scenarios have proven helpful in the decision making in uncertainty. They also suggest "portfolio theory" (make sure that risk and reward are commensurate, then assemble a portfolio that in the aggregate reflects your risk profile) and "decision trees" that track the consequences of serial decisions leading to a goal as other useful methods in facing with high degrees of uncertainty.

### **Why Should We Detect Weak Signals?**

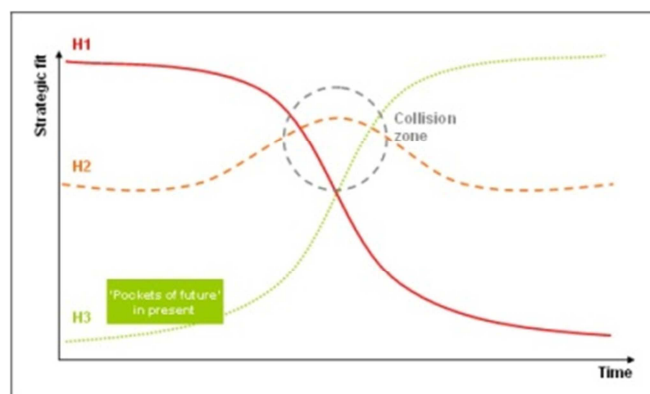
We detect *weak signals* in order to provide early warning about important future changes. The future, by definition, presents itself as *weak signals* before evolving into a full-blown trend that will affect your business (Garland, 2011). If we wait for trends and events to be reported by the major media before acting on them, we will forever be at the mercy of those actively collecting information about what's next and acting early. This is why the future of futurism is likely to be found in the gathering of intelligence from various sources and making our own judgments about the value of the information collected. It is hard, but worth the time. It is somehow related to our text mining duty.

By detecting weak signals we can alert an organization to emerging trends that should be taken into consideration when scoping the foresight exercise (FORwiki, 2011). It's a part of environmental scanning. According to Jackson (2011), perceiving weak signals of change requires very different sources from collecting evidence for more clearly defined issues and trends. When a change is just emerging, and only a few data points exist with which to characterize it, we can only analyze it via a case study approach; changes indicated by limited data points and observations are referred to as "weak signals" of change. Sources here are likely to include blogs, fringe publications, and conferences.

In a study (The Futures Company, 2009) weak signals were categorized into three main categories:

- Category A: Weak signals which do not appear to be covered in the systems work and scenario vignettes;
- Category B: A spectrum of clusters ranging from those which fit into the systems map but are not explored fully, all the way to those which appear a challenge to the paradigm within the model;
- Category C: Weak signals which appear to be well-represented within the model.

A 3 Horizons framework can be used to identify and classify emerging signals. A diagram of the framework is given below.



Each 'horizon' is a curve plotting the strategic fit of systems to the external environment across time.

**Horizon 1 (H1)** systems are dominant at the present and on the whole provide a good fit with the world as it is. The elements making up these systems – ideas, technologies, cultural practices, etc.–are mainstream and routinely form the basis of government policy and organisational strategy.

**Horizon 3 (H3)** systems, by contrast, do not tend to be systems in a recognizable sense. They are collections of ideas found at the edges of mainstream discourse or beyond, more likely to turn up in specialist journals or weblogs than in policy documents.

**Horizon 2 (H2)** describes adaptive responses to the challenge that an emergent H3 poses to a declining H1. These responses may take the form of modifications to H1 ideas and practices to re-fit them to an increasingly H3-orientated world, or dilutions of H3 ideas and practices to allow their earlier acceptance by H1 actors.

## Why Text Mining Is an Everlasting Business?

We might never dream of becoming a futurist in our past thoughts, but from now on we can really count on an eternal job: Text Mining. It's eternal because we always deal with numerous texts in our daily studies and works. Yes, the content is the king and we can proudly serve this king.

According to Alan L. Porter (2009), *Tech Mining* is short for "text mining of science & technology information resources." Simply, we seek external information sources to mine. Text mining empowers powerful variations on content analysis. Data mining seeks to extract useful information from any form of data, but it had been commonly used to mean analyses of numerical data. Counting scientific publication activity dates back at least to the pioneering work of Derek Price in the early 1960's.

Searching in an appropriate publication abstract database such as *EI Compendex* (also known as *Engineering Index*) yielded several thousand abstracts. The information we usually seek for in texts covers: *WHO, WHAT, WHEN and WHERE*. Text mining is in close relationship with technology. In this sense, "Tech Mining" emphasizes extracting useful intelligence from databases.

Here's an 8-step approach to Tech Mining:

1. Spell out the focal MOT (Management of Technology) questions and decide how to answer them
2. Get suitable data
3. Search (iterate)
4. Import into text mining software (e.g., VantagePoint)
5. Clean the data
6. Analyze and interpret
7. Represent the information well
8. Standardize and semi-automate where possible

Porter (2009) suggests combining Tech Mining results with expert opinion to take advantage of the strengths of each. Training is needed to perform Tech Mining effectively. Analysts familiar with treating "text as data" can quickly grasp the concepts and generate useful findings. Meanwhile, Tailoring information products carefully to the key users' needs is critical. Relationships between analysts and users must be strong.

## Where Roadmapping Is Losing and Winning?

A science or technology roadmap shows the intersections between scientific steps or technologies. It is forward looking and forecasts the paths that might be followed to a final or desired achievement. Thus it is both a normative forecasting tool and a planning technique (Glenn and Gordon 2009).

There are two threads that led to science roadmapping: first, historical studies of the chain of scientific or technological events leading to an innovation or system; second, a planning technique, Program Evaluation and Review Technique (PERT).

Roadmapping is used to programs or projects when any of the following is present:

1. High potential for mission failure;
2. Significant consequences if failure occurs;
3. High dollar costs, high worker exposure, or high environmental impact;
4. Multiple, diverse efforts working on a common problem;
5. Significant political or senior management visibility.

Dennis Clerke of Aligned Software (2006) lists a number of benefits of roadmapping as following:

1. Produces greater alignment between R&D spending and product development initiatives.
2. Sharpens clarity of strategic vision, resulting in better-informed decision making
3. Manages data, product plans, and goals at a high level.
4. Links markets, products, technologies, capabilities, and supplier intent.
5. Enables discovery of technology re-use and synergy opportunities.

However, its weaknesses derive from several principal sources including the need for deep expertise, and complexity. A roadmap reflects the knowledge of the people who formed it; hence it is essential to enlist the support of the most expert persons available. This criterion applies to the Delphi technique as well. Failing this, the roadmap will be mundane. On complexity, most topics of interest are ultimately found to be fractal, that is, the more detailed the analysis, the more detail is left to discover. When the subject is fundamental research, the identification of nodes is particularly difficult since the nodes will inevitably include discoveries not yet made.

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