

Understanding the Future

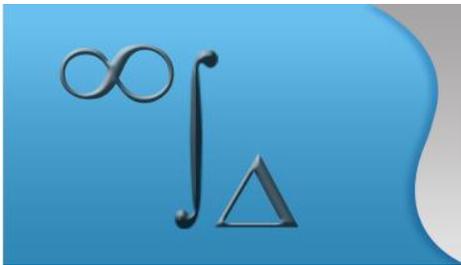
Understanding the Future

A Practical Guide to Designing and Developing
Context Specific Segmented Forecasts and
Models for Technology Markets

Technology Forecast Approaches

August 2012

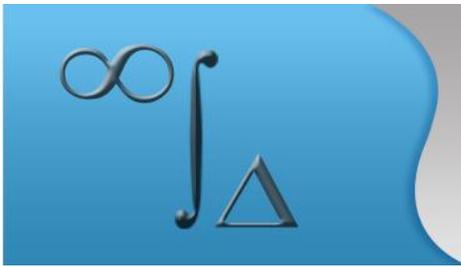
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Chapter 3 – Technology Forecasting Approaches

Technology market research, including forecasts, addresses eight fundamental questions about technology markets:

1. **Market Size:** Does a market exist and if so, what is the potential maximum size of the total available market?
2. **Market growth rate:** How much of the total available market has been penetrated, when will total penetration be achieved, what market phase are we currently in?
3. **Market segmentation:** Are there natural segments of the market that differ in terms of market penetration, buyer behaviors, or competitive threats?
4. **Competition:** All forms of competition need to be identified including those based on older technologies, anticipated future innovations, and current products and services offered by competing vendors as well current available alternative solutions to the same problem set defining the need for that produce or service.
5. **Competitors:** Which vendors are currently in the market? Who may yet enter and who may exit? What are their competitive strengths and weaknesses? What can be learned about their intentions?
6. **User trends:** Are the behaviors and actions of the users changing over time, and why?
7. **Technology trends:** What innovations and technologies are anticipated in the future? What are the technical and competitive inhibitors and accelerators that are influencing the innovation and commercialization process?
8. **Buying process:** How is the buying process structured in terms of steps and stages? Who are the influencing, voting, and vetoing individuals and constituencies in each stage? What are their concerns? How do they obtain information about technology?



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There is a high degree in interdependence among these questions with the answers to many dependent on one or more of the others. All will affect technology forecasting to some degree and therefore need to be addressed. There are many approaches available to forecasting technology. In fact, the choices can be bewildering since there is no standard taxonomy, and a review of the existing literature on this subject will present many of these approaches in a variety of classification systems and nomenclatures.

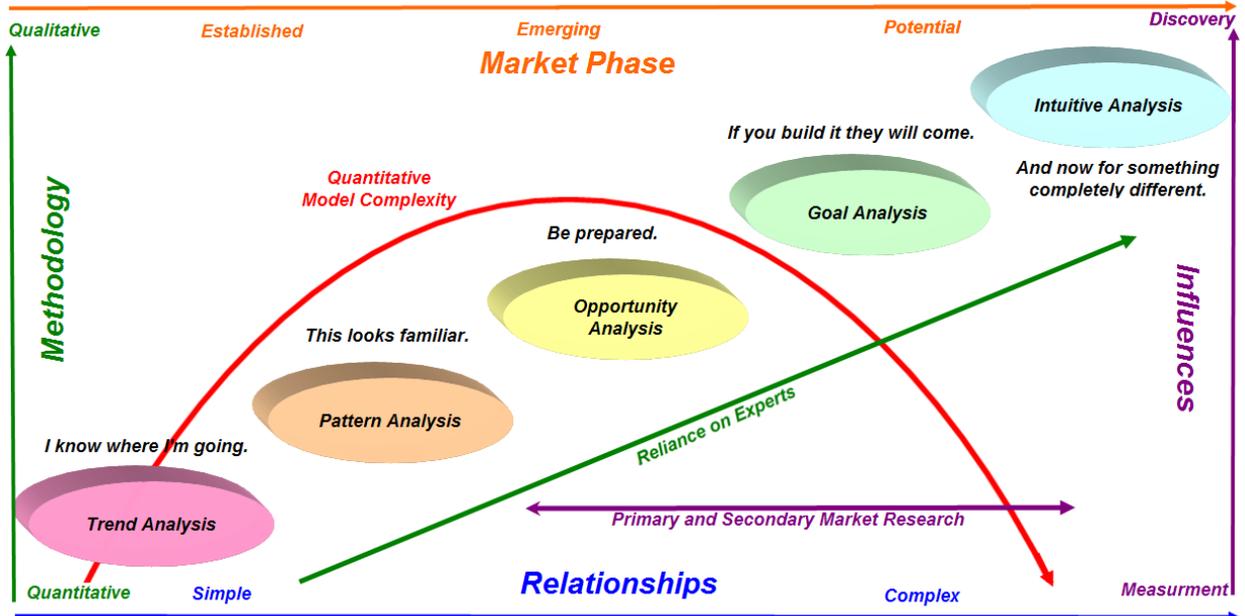
One of the clearest discussions of the most common approaches is found in Lawrence K Vanston's Five Views of the Future™, A Strategic Analysis Framework. This framework has influenced a large number of other practitioners. I have drawn upon this work heavily to develop our own framework. Vanston's classification of technology forecasting approaches is summarized into five broad categories:

- ✓ **Trend Analysis**
- ✓ **Pattern Analysis**
- ✓ **Opportunity Analysis**
- ✓ **Goal Analysis**
- ✓ **Intuitive Analysis**

These categories may be compared and contrasted along four dimensions:

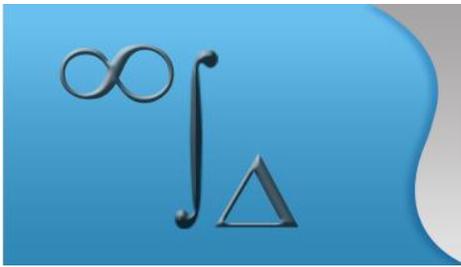
- ✓ **Methodology** - Highly quantitative to intensely qualitative.
- ✓ **Market Phase** – Pre-launch, launch, take-off, maximum growth, peak, decline, end-life.
- ✓ **Influences** – Few and well understood where the task is to measure the impact, to many or even unknown where the tasks is to discover the influences.
- ✓ **Relationships** - Simple and well understood to highly complex.

Chart 2 - Technology Forecasting Approaches



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The approaches presented in this context progress in a somewhat orderly manner according to the mix of quantitative modeling to expert insight. Quantitative modeling complexity reaches its zenith in the middle of the mix where simulations and scenario modeling reside. As the data and knowledge that fuel quantitative modeling is exhausted, reliance on individual and group intellectual synthesis begins to dominate. While traditional primary and secondary market research can be used in support of any approach, it is most often used with Opportunity and Goal analysis. Which of the approaches are appropriate will also relate to the nature of the decisions and uses of the forecast – context, as well as type of data, information and knowledge that is required.



Trend Analysis

Trend Analysis assumes that the future is a logical continuation of the past and therefore may be accurately represented mathematically. The approach requires that all of the significant influences and how they relate are known, and can be expressed in mathematical form. The primary methodologies utilized are models based on time series analysis, extrapolation and curve fitting and the adoption models.

By definition, this approach is applied to forecasting markets that already exist and are in known phases of the technology adoption process, including end of life. While this approach is primarily based on historical data, the models allow for intelligent intervention if other approaches bring into question the fundamental assumptions about influences and relationships.

Forecasts based on trend analysis approaches are primarily utilized to support decisions and related uses concerning marketing strategy and resource allocation, as well as general on-going tactical business planning. Longer term research & development and strategic planning decisions concerning alliances, mergers and acquisitions, or market entry or exist, may also require trend analysis forecast, but do not solely rely on them.

Pattern Analysis

Pattern Analysis searches for repetition, similarity, or correlation in historical or concurrent independent datasets. This approach includes modeling based on analogous or precursor historical data, concurrent enabling or prerequisite data as well socio-economic, demographic, firmographic or technical trend data. While primarily employing quantitative methodologies, judgments have to be made about the nature of the relationships as expressed in the model algorithms.

While most of the driving and constraining influences will be known, some effort is usually made to validate these assumptions. These models tend to be more complex and multivariate, often incorporating recursive and iterative feedback mechanisms. Pattern analysis forecasts are used for many of the same set of decisions and uses as trend analysis forecasts with a shift of emphasis to longer term and market entry/launch decisions as well as guiding the direction of research and development efforts.



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Opportunity Analysis

Opportunity Analysis attempts to define and prepare for rapid exploitation on a range of possible futures rather than a single state. Vanston calls this approach “Counter Punch Analysis”, while others have labeled it Emerging Pattern Monitoring. The focus is on the variance in the process rather than on central tendencies and requires the use of stochastic modeling methodologies including simulations and scenarios building. Quantitative complexity is at its maximum in the methodologies utilized in this approach reflecting the growing uncertainty of the inventory of influences as well as the exact nature of their interaction.

Notwithstanding the complexity of the models, qualitative inputs share equal weight with quantitative methods in this approach, are highly dependent on structured observation and interpretation of technological and market events. At the heart of opportunity analysis is constant surveillance through scanning, monitoring, and tracking. There is also an implicit assumption that while future drives and constrains many not be fully known, there are no strong anchors to the past. Market phase focus is clearly on emerging and future markets but can span all phases. Decisions and uses center on high-level strategic business decisions and research & development guidance.



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Goal Analysis

Goal Analysis predicates its vision of the future on understanding the attitudes, perception, and opinions of influential supportive and opposing constituencies. This is the first approach that includes the behaviors and actions of small groups and key individuals, in addition to population masses. The methodologies observe and gather information qualitatively with some translations into metrics for comparison and ordering. Vanston lists Impact Analysis, Content Analysis, Stakeholder Analysis, and Patent Analysis as methodologies for this approach. I also include Morphological Matrices while Vanston positions this in his 'Counter Punch' group.

This approach has two objectives. First, it widens the surveillance for drivers and constraints. The development and adoption of standards, competitive counter measures, social policy apparatus, governance issues, and intellectual property are typical domains of interest in this approach. The focus is on discovering unintended consequences that may act as either opportunities or obstacles. While the first objective is decidedly defensive in that it searches for inertia in the system that needs to be overcome, the second objective is inherently offensive; to facilitate ideation. Products and processes are defined, evaluated, developed, and brought to market by discovering unmet current or anticipated needs, along with near term applicable innovation,

The use of Goal Analysis is to create forecasts for very early phase and future potential markets. On occasion, we employ it to discover why an established market has failed to reach levels projected by the other approaches. Decisions and uses are mostly in the marketing and research & development areas.



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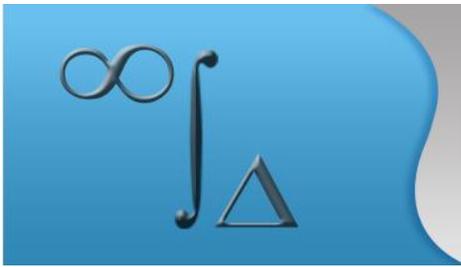
Intuitive Analysis

Intuitive Analysis harnesses the power of the expert mind, either individually or in collaboration to assimilate all of the relevant information about the influences, their interactions, and arrive at a conclusion unattainable by other means. In this situation, we do not know the complete inventory of influences, nor are the interdependencies well defined, and there is very little quantification available.

The objective is not so much to define a future state as to discover the cause of that state. Methodologies include Delphi Surveys, Nominal Groups, and interviews, both structured and unstructured. The period for discovery is clearly future potential markets with decisions and use residing in the research and development area.

In practice, one should never rely on just one approach but incorporate several. Answers to the next three questions determine which ones are appropriate:

1. What are the market phases that the forecast spans?
2. How certain are you that all of the relevant influences are known?
3. What is your level of understanding about the interrelationships of the influences?



There is a loose correlation between the five approaches and the eight fundamental questions. In practice, we can obtain data, information, and knowledge supporting answers to any of the eight fundamental questions from any of the five approaches. However, efficiencies are gained by matching the optimum approach to each of the questions as shown in the table below.

Relationship between Five Approaches and Eight Fundamental Questions

Questions	Trend Analysis	Pattern Analysis	Opportunity Analysis	Goal Analysis	Intuitive Analysis
What is size of the market?	✓	✓	✓		
How fast is it growing?	✓	✓	✓		
How is it segmented?	✓	✓	✓	✓	
What is the competition? Products & Services			✓	✓	
Who is the competition? Vendors & Alternatives			✓	✓	✓
What user trends drive the market?			✓	✓	✓
What technology trends drive the market?			✓	✓	✓
What is the buying process?			✓	✓	✓



Daniel Research Group offers consulting and market research services to clients whose products and services are technology based or enabled. The primary focus is on providing results, solutions, consulting and training to clients that have strategic and tactical decisions that require Forecast, Segmentation, Market Share, and other market modeling requirements. These engagements are supported with the full range of traditional market research data gathering and analysis services, including quantitative and qualitative surveys, focus groups, demographic and firmographic data acquisition and analysis, as well as input from technology and industry experts. While our emphasis is on delivering data and actionable recommendations, we often design and develop custom models and modeling tools for client use as well as providing training in these areas.

Stephen J. Daniel - President

Mr. Daniel's three decades in the Information Technology Industry has given him a unique blend of Market and Technology experience coupled with a deep understanding of Market Research Methodology. His primary strength is in understanding the decision making context within which the results of his research will be applied. This is manifested by his ability to design and execute studies that precisely meet client objectives on schedule at reasonable costs.



After receiving his BS in Finance in 1970 from Northeastern University, Mr. Daniel earned an MBA in Quantitative Analysis from New York University in 1974. He is a member of the American Statistical Association, The Market Research Association of America, the American Marketing Association and the Qualitative Research Association of America.

Daniel Research Group is a market research firm specializing in the design, development and application of market models and forecasts for clients in the technology sector including supplier, investors, and other market research firms. For more information contact Steve@DanielRG.com or visit www.DanielResearchGroup.com.