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A Brief Introduction to the Future[1]

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INTRODUCTION

This is an overview of some techniques and rules for estimating the future course of events and assessing the impact of those events on your future and that of your organization over periods of a few years to a decade or three. Although many of the methods used in this review are quantitative, it is extremely important to realize that they are only approximate; the future almost never turns out exactly the way we expect. Given that caveat, the following should help penetrate the increasing murkiness of the future.

THE FLOW

The first thing to remember is that the future is irrevocably tied to the present and, to a lesser extent, to the past. The future begins *now*. Having read this, you are now a tiny distance into what was the future a few moments ago. The *real* future begins *Now*. Not much different is it?

Well, possibly it is. You have taken a breath or two, someone has just died somewhere, about 2.7 someone else's have been born, some ancient, fossilized ferns have been converted to carbon and nitrogen oxides and water vapor via automobile engines, some telephone calls have been made, a few trillion computer processor cycles have been completed, and so on. All of these things have been happening at about the same *rates* as they were when you started reading this article. Incremental changes.

The most important facts about the future are , first, that it depends on a series of changes in almost everything and, second, that it is impossible to know what all of those changes are or will be. That is, the future is the result of the growth/decline of a vast number of trends, each of which comprises an infinite number of events, some of which are (or seem to be) discontinuous.

Discouraging as that sounds, there is still hope. We can still do a reasonably good job of estimating quite a number of these changes, while many of the others may not be of concern to us in the short term. So, when it comes to assessing the possibilities of the future for oneself or one's own organization, a relatively manageable set of examinations may suffice to give a fairly accurate picture.

Another important fact is that **the past has inertia**; the near future tends to be pretty much like the past—huge, abrupt changes are rare.[2] Further, *homo sapiens* is probably the greatest change agent there is, at least in the short term (a few decades or centuries).

Therefore, one key to understanding the possibilities of the future lies in understanding what people are doing to change the present. There are three primary things that people are doing to shape the future:

1. They are reproducing faster than they are dying; therefore, their relative impact on the global allocation of resources is increasing.

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[1] Substantial portions of this paper constitute Appendix E of the book, *Managing Telework; A Guide to Managing the Virtual Workforce*, published in 1998 by John Wiley and Sons (ISBN 0-471-29316-4).

[2] But not impossible. When they happen, the consequences tend to be spectacular.

2. They are inventing and using ever more powerful tools; therefore, the per capita leverage on resource use is also increasing.

3. A growing proportion of these tools primarily is information manipulators rather than physical resource extractors/manipulators; therefore, the *interaction range* of individuals is increasing. To the extent that the information tools enable more efficient design of the other tools, they act to reduce resource impacts of those tools.

Each of these aspects of the future can be characterized in terms of *critical trends* and *pivotal events*. So, the process of assessing the future boils down to:

1. Identifying the key trends (that might affect you and/or your organization).

2. Identifying the pivotal events that may act to alter those trends.

3. Identifying the interactions between the various events and trends.

Simple, isn't it? Just follow the easy, step-by-step instructions.

Categories of Trends and Events

However, before jumping into a full-fledged attempt on the future, let's examine some of the types of trends and events with which we have to be concerned. These groupings are admittedly somewhat arbitrary, but they are selected partially to point toward sources of information about the nature of the past and present from which the future evolves.

Society

Some of this category is easily assessable. It includes such factors as world/national/regional/local demographics, size of the workforce, education (years of schooling), and the like. Most of this is available from various government sources, at least for the U.S. The data tend to be less easily available and/or reliable in some other countries.

Other factors may be less accessible. For example, group or individual attitudes toward X, customs, consumer demand, educational attainment of various sorts (particularly education outside the formal system), and communication patterns.

Technology

This group is by far the easiest to forecast, at least for a decade or so. The reason for this is that most of the technologies that will be in common use ten to twenty years from now already exist in a lab somewhere. The trick is in estimating the adoption rates of the technologies, which often depend more on the human equation than the physics. Information technologies (including many biotechnologies) have the highest sustained growth rates and are the dominant force in influencing other trends and events.

Economy

The economy, whatever that is, is usually a perfect example of the need for better chaos theory. The one-handed economist is an oxymoron. Nevertheless, trends in the general economic climate, and many of the economic details are powerful influences on almost everything else. Failure to acknowledge or take account of economic trends and events has led to disaster for many companies and governments.

Key economic trends include the composition of the workforce and employment demand, GNP and GDP, stock and bond prices, etc. Here, as is the case for societal trends, substantial amounts of data are fairly accessible.

Laws and Regulation

The legal and regulatory environments can place constraints on the growth of trends or on the occurrence of events. They can also accelerate the growth of trends and increase the likelihood of events. For example, air quality laws and regulations in the U.S. act to inhibit the use of private automobiles for commuting to work. At the same time, they act to increase the rate of adoption of telecommuting, shifting the "market share" from one set of technologies to another. Similarly, telecommunications regulations can act to enhance or impede other trends.

While information on the existence of various laws and regulations tends to be readily available, information on their influences on other events and trends often is more problematic

Marketplace and Competition

This category covers the actual composition, growth, and decay of various markets and products and the competitive influences thereon. Data on markets and competition, while available from numerous sources, are often of questionable quality and reliability. Hence, one of the main challenges in this important category is finding trustworthy sources.

Organization Structure and Operations

This category deals with the questions of how organizations work: how they are structured, how work is accomplished, how organizational units interact among themselves, with suppliers, and with customers. "Downsizing" and "outsourcing" are organizational trends that have been growing for at least a decade. Also in this category are such things as trends in the size and geographical distribution of organizations, the formation of new organizational types, such as network organizations, or modes such as hoteling and other forms of teleworking.

Scenarios and Alternative Futures

A natural response at this point is: *Why do I have to know all this? After all, my job is to make next week's payroll; why should I worry about things that may not happen for years?* The answer to that depends on your planning horizon. If your job consists solely of getting through the day you probably wouldn't be reading this in the first place. If your present or anticipated job has to do with plotting a course for your company in today's turbulent times—and you also want to be doing so ten or twenty years from now—then this is important. Successful strategy formulation requires accurate assessments of the possibilities of the future.

Future Funnels

As those first few statements about the future implied, our uncertainty about the future[3] increases with distance. We know pretty well how last week turned out, we may know how today will finish, next week is a little more iffy, next month even more so. As to next year, or ten years from now, who knows?

The bad news is that the future is a collection of funnels, with today at the spout and the distant future out at the wide end. Inside each funnel are all the possible paths that a particular series of events—a trend—may take. The width of the funnel at the distant end is a measure of our uncertainty in estimating those paths.

However, the good news also is that the future is a collection of funnels. It is not completely indeterminate; it is not a hemisphere starting with the present. Some things just won't happen in a given time horizon, others are certain to happen. Our task is to see how tightly we can specify the outlines of the funnels. Figure 1 illustrates the idea in two dimensions.

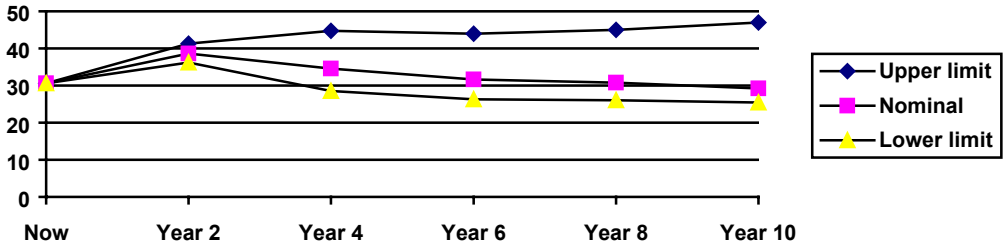
[3]Or with the past, for that matter.

Further, we need to realize that the future comprises two components:

1. Things we can't do anything about, like the weather and earthquakes.
2. Things whose outcome we can influence, like investment decisions.

We need to know about both of these, either to realize how they might influence our personal futures regardless of what we do, or to estimate how we can alter the course of the future to increase the likelihood that it will evolve the way we want it to.

Figure 1: A Trend "Funnel"



Several things are illustrated in Figure 1.

- First, future trends rarely unfold as straight lines; as linear (or exponential) extrapolations from the past.
- Second, there usually is a "nominal" or most likely future, somewhat like a strange attractor in chaos theory parlance.
- Third, there tend to be upper and lower bounds to the future, beyond which it is extremely[4] unlikely that the particular trend will go.
- Fourth, the upper and lower bounds need not be symmetrical about the nominal case.
- Fifth, pivotal events act to alter the course of trends. That's why they're called pivotal. Such an event is anticipated in Year 2 of the trend in Figure 1.

Usually a first step in assessing your future is to identify the trends, in all of the categories above, that are relevant to that future. Next, estimate the course of the trends over a sufficiently long term; that is, until it no longer matters or it becomes completely unguessable. Then, estimate what events could occur to alter the course of the trends. Having accomplished these exercises, you are ready to begin some serious crystal ball gazing.

Cross-Impacts

Another important fact about the future, as well as the present, is that **everything seems to be connected to everything else,** although the strength of the ties between any two events/trends may be imperceptible. Thus, as your next step in divining the future, it is necessary to estimate the impact of the occurrence of event A upon the likelihood of occurrence of event B in trend C. Then if event B occurs, partiality as a result of event A's occurrence, what is the effect on the likelihood of occurrence of events D and E? What if the anticipated event B (or A) doesn't occur, or occurs later than expected? What then?

[4]Sometimes a number can be associated with "extremely" that indicates the non-zero probability that the trend will go beyond it. This recalls the lines from Gilbert and Sullivan's *Mikado*: "What never? No, never! What never? Well . . . hardly ever."

In short, what are the key cross-impacts in your future?

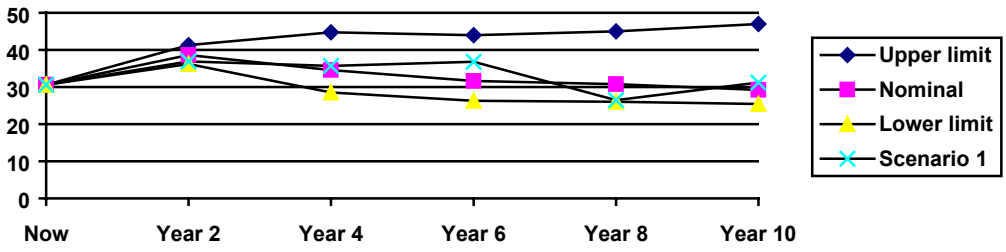
Events and trends don't ordinarily just happen at random, although it may seem like it at times. Usually any important trend is accompanied by a series of pivotal underlying events and trends. Computers are important today partially because some labor problems in 18th century France (a growing trend) prompted Basile Bouchon and, later, Joseph Marie Jacquard to develop punched-card-controlled looms in their textile factories (pivotal events). Much of the contemporary information industry owes some part of its existence to a laboratory curiosity assembled by John Bardeen, Walter Brattain and William Schockley at Bell Telephone Laboratories (a pivotal event). Because it was neither a conventional conductor nor a resistor, but somewhere in between, they called it a *trans*istor. The consequent development of microelectronics (a major trend) has made possible lunar landings, Star Trek, the Global Positioning System, the Internet, declining population growth in developed countries, and Mutant Teenage Ninja Turtles.

Detailed cross-impact analysis involves setting up a matrix (or successive series of matrices depicting successive times in the future) of events and trends. Each row of the matrix starts with an event heading. The column headings indicate the probability of occurrence of the event and the names of other events and trends. Each intersection in the matrix indicates the probability of occurrence of the impacted event—or the nominal change in slope of the impacted trend, given that the originating event has occurred. This provides a better feel for these often-complex interrelationships.[5]

Scenario Development

All of the preceding is a buildup for creating scenarios: descriptions of alternative futures. A scenario, as the title implies, is simply a play-by-play description of the future. Starting with today, the future is described at several regular (or reasonable) intervals up to the end date, some days, weeks, months, years, or decades hence. The description derives from an interval-by-interval analysis of what has just "happened" as you venture into the future. The scenario—or the latter portions of it—is the most common way of presenting future possibilities to more general audiences.

Figure 2: A Trend "Funnel" plus Scenario



The usual quantitative scenario recipe goes like this. (Figure 2 gives an example.)

1. Start with today. Describe the principal characteristics of today that are important to you.
2. Now, jump to the first stop in the future; say, next year. What is the range in status of the important trends?
3. What pivotal events have "occurred?"
4. What has been the effect of those on the trends?

[5] Strategic Futures International, Inc. and JALA International, Inc. have developed a PC-based system that automates this process. Called *Serious Scenarios*, in minutes it can create—and rank—hundreds of scenarios from dozens of events, trends and their cross-impacts.

5. The answer to step 4 gives you a reason to pick the "actual" value of each trend for the end of that interval. So, now you have a new description of the status of your world at that point in the future.

6. Repeat steps 2 through 5 for the subsequent intervals to develop the complete scenario.

This particular method gives you one specific path through the future. Its utility is that it demonstrates that the future never exactly follows the original trend lines, but tends to wander about them. If you want to get a more global view of the possibilities, it is necessary to repeat the recipe many times—several thousand in the case of scenarios involving many trends and/or events. Known as Monte Carlo scenario development, this task is best left to computers.[6]

TOOLS FOR FUTURE CLIMBING

Throughout this discussion there has been the implicit assumption that somehow you already know the shape of the trends and the occurrence and impact statistics for the pivotal events. In real life this is rarely the case, except for problems that are so well defined as not to be interesting. If you wish to come to grips with the future it is usually advisable to use some formal tools to help shape your understanding.[7]

Formal Mathematical Models

Every strategically useful description of the future involves some quantitative descriptions. We need the numbers to help assess the relative merits of the alternatives presented to us. Formal mathematical models can help in this process. They are used to generate specific trend lines and can be used in a piecewise manner,[8] thanks to computers, to account for the impacts of pivotal events.

Formal mathematical models are equations that describe a particular type of future behavior. An example is the so-called logistic (or epidemic) curve that fairly well describes a huge variety of real phenomena from inception to growth to maturity to decay. Exponential curves may be good for relatively short term forecasting (nothing grows exponentially forever). Even straight lines may work in some situations. Formal models are most useful where the trends are fairly well constrained; that is, not subject to many random-appearing alterations in course.

Statistical Methods

For more complicated trends, statistical tools may be the choice. An entire sub-industry uses statistical methods to anticipate the moods of the stock market (program trading being one of the fruits of these efforts). Generally, the objective is to curve-fit; that is, identify some sort of formal mathematical model that matches the sequence of means of a statistical analysis of a train of past events. Like the case of the other formal mathematical models, the hope is that the nature of the events won't change during the post-data forecasting interval.

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[6]Usually , this is done with a customized computer program. However, an add-on to Microsoft's Excel for Windows, called (what else?) Crystal Ball, can do this task to some extent.

[7]For a much more detailed overview of these tools, see *Technological Forecasting for Decision Making* by Joseph P. Martino, Elsevier Science Publishing Co., various editions.

[8]That is, with the parameters of the model changing from interval to interval.

Delphi

Statistical methods and formal mathematical models are fine when you have quality historical data and/or an accurate idea about how a trend will unfold.[9] But what about those cases where there are no data—the trend hasn't begun yet—and you don't have a clue as to its likely course of development? In these situations, the Delphi method is often the principal tool.

The fundamental principle of Delphi is: Ask the experts what they think. The process is a little more complicated than that. First, it is important that you ask certified experts; people with established track records of guessing right in their chosen fields. Second, to minimize the danger of one expert unduly influencing the others, do *not* bring them together, either in a face-to-face meeting or in a teleconference version thereof; ask your questions via some form of private correspondence (a questionnaire) and keep their answers anonymous. Third, ask multiple experts for each set of events and trends, compile the results and send them to your panel, asking for further comments. If there are any large discrepancies and/or differences of opinion, ask for clarification (sometimes you have to reformulate the questions). Keep doing this until you have reached general agreement about the shape of the trends (including upper and lower limits) and the numbers for the pivotal events.[10] Once you have the events and trends nailed down, do the same for the cross-impacts.

Building Strategies

All of the above is simply preparation for the real purpose of futures research: developing strategy and tactics for your organization. Consider the term **strategy**: a plan for realizing a specific goal; putting yourself in a position where you can take best advantage of the opportunities that arise. Adapting yourself to the future.

This brings us to another important rule: **There is no THE future**. A particular scenario is not a description of what WILL happen; it is a view of one particular train of events (among an infinity of possibilities) that is almost guaranteed not to happen in detail.

Does this mean that developing scenarios is a waste of time, since they never really turn out that way? Not at all. Scenario development, particularly repetitive scenario development, is extremely useful in testing your strengths and weaknesses, your ability to adjust to the REAL future as it unfolds.

The reason for all this modeling and scenario development activity is so that you can develop a map of all the rocks, shoals, and currents of the part of the future that will affect you. Particularly important is the use of these techniques to detect **surprises**.

This results in the mention of another rule: **When you are formulating events for your scenario development, make sure you include as many as you can think of that, while they may be very unlikely, have high impact**. Earthquakes may not happen all that often but, if you're in one it's nice to be prepared to cope with it. Ditto for opportunities of a lifetime. The Gulf War strategy (ours, not Saddam Hussein's) was based on a huge series of prior "games" such as those outlined here. Intel apparently didn't bother with this sort of exercise prior to reacting to the Pentium floating point unit problem.

The description above of scenario development needs another step. Call it 5a:

5a. After reviewing the result of the scenario increment, ask yourself: What can we do to change things so that the next step is more in line with our goals? What will it cost? What are the risks/benefits? Therefore, what should we do now?

This is where you can formulate strategic options and test the possible impacts of your strategic decisions. In principle, it's the same as an arcade game; you are training yourself to use the tools you

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[9] For example, the trend in question may be expected to be very similar in shape to a previous, well-defined trend. This is often the case for technological trends.

[10] The numbers are: What is the likelihood of the event having occurred by $time_1$, $time_2$, $time_3$, etc.

have to avoid dangers and arrive safely at your (possibly mobile) objective. The future holds an infinite number of possibilities. Unfortunately, your resources to cope with them are probably very finite. Therefore, they have to be allocated wisely. Gaming the future, by this sort of repetitive scenario generation and analysis can give you a tremendously heightened awareness of how your decisions can affect the outcomes.

Good hunting.