Up and to the Right-Market Information for Technology Forecasting

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An industrial research laboratory has to take a long view of technology. There is increasing pressure to make a business case for research projects. There is plenty of data and analysis of the past. There are a great many sources of news about the present. There is no shortage of individuals and agencies willing to predict the future. What does the researcher make of this? How do they build their own picture to complement their technical work? The aim of this paper is to provide an insight into the information needs to support technology forecasting. The paper discusses the research environment. It focuses on short-term requests which put the most pressure on information services. It considers the information needs, the available resources, and the reliability of forecasts. The emphasis is on the analysis of published market information to support researchers in their technology goals.

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Forecasting as applied to business is a relatively new discipline. Pioneered in the 1950s, it has developed apace with the introduction of computers. There are many forecasting methods, ranging from the subjective to the highly mathematical. The potential applications within a single company are legion. This report looks at the information needs to support forecasting in a technology research laboratory. Short-term requests for market figures can put a heavy demand on a lab's information services. The technology area may already be familiar, and the sources well understood. But the request itself is often unique and unpredictable. It may be submitted at short notice, to back up a meeting or a business trip. This scenario challenges information professionals to come up with data, and to analyse it under pressure.

The paper focuses on this particular need, in order to illustrate the use of information resources. An overview of forecasting is followed by a consideration of the information needs within a research laboratory. The paper concludes with a brief discussion of some of the information sources which are used to support forecasting.

1. Forecasting in industry

From its introduction to business in the 1950s, forecasting has been taken on board by companies eager to work out which products they should develop, and to determine the market for their goods. In product marketing, decisions take into account forecasts of market size and the company's potential share. In production, forecasting is used to plan materials purchase, workforce planning and equipment purchases. Finance departments use forecasts to keep track of cash flow and expenditure. These are just some examples of the applications of forecasting.

The introduction of computers accelerated the development of forecasting, making it more viable to maintain a forecast. Techniques range from the subjective 'jury of executive opinion' to mathematical techniques like exponential smoothing and trend-line analysis.

The timescale over which the forecast is made varies according to the need being served. For example, a production facility has a short-term need to forecast the demand for each current product. Over a longer time frame, it needs to look at categories of products, employment levels and costs. Looking further ahead, it needs to consider the demands for machinery, new technology and possible plant expansion. R&D departments' needs are more long term still. They are involved in new product introduction and the future demand for products which are yet to be developed. The accuracy which is attainable - and indeed desirable - is related to the term of the forecast and the maturity of the technology.

2. How reliable are forecasts?

History is littered with the debris of forecasts which went awry. The most careful forecast can be upstaged by unforeseen events. Advances in technology may outstrip the predictions of 5 or 10 years ago. Figure 1 shows a prediction which was made in 1974 of the relationship between price and performance of computers. Plotted against this are the actual price/performance figures for two machines which beat the forecast trend by several years. Instead of just improving the price/performance of large machines, large-scale integrated circuits enabled small, less expensive computers to match the performance of their larger cousins.

More commonly, predictions are made for a technology which is emerging or even ready for use. But in the event it either never makes it into the market, or its entry is delayed for many years. In the early 1980s, forecasts for home information services were predicting that up to 5% of US households would have videotex by 1985. All the enabling technology was available. One company spent $60 million setting up a service which never made money. For most people in the home, it was simpler to use newspapers and printed catalogues and encyclopædias.

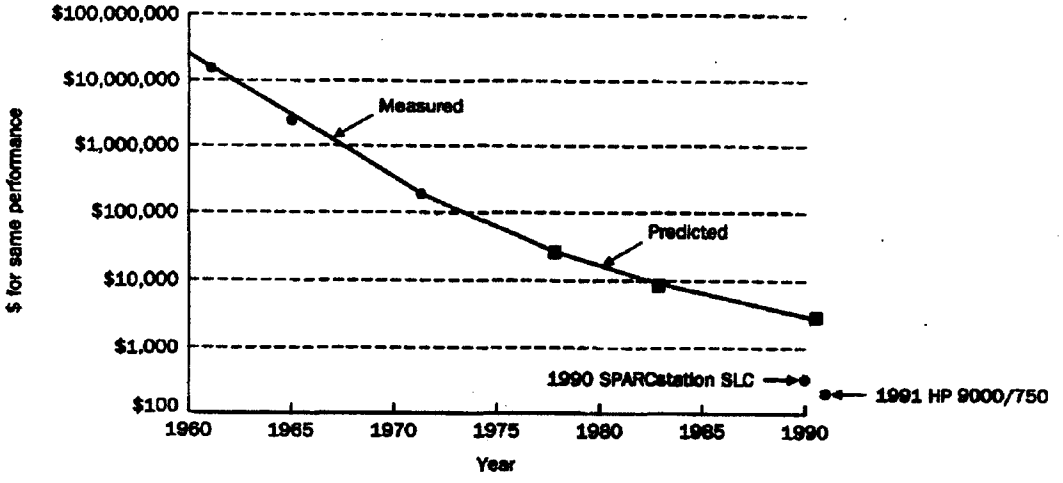

Figure 1: 1974 Prediction of computer price/performance in the 1980s. From David A. Patterson and John L. Hennessy, *Computer organization and design: the hardware/software interface*, 1994

A change in fashion can turn a market on its head. A *Financial Times* article exploring the pitfalls of the diamond market cites the value of coloured diamonds. Ten years ago, these were worth less than colourless ones. Today, a blue 15-carat stone will fetch more than $300,000 a carat; the same stone in pink can fetch $400,000. Compare this with $50,000 for a colourless stone. This trend was triggered in 1987 by the sale at auction of a red diamond for $920,000 a carat.

The job of the forecaster is to look at today's predictions; to interpret them; and to consider what may happen in the future to affect them. This requires looking beyond the published numbers, to broader issues like legislation, demographics and economics.

Over time, an information specialist gets to know their way around the published sources. If two market research agencies have different views of the past and present, an investigation of this will help to evaluate and interpret their view of the future. The differences could be due to many things: the geographical base of the respective agencies can introduce a bias; use of terminology may vary, especially with emerging

technologies; underlying assumptions frequently vary, e.g. the life of a product in the customer's hands. Vested interests skew forecasts. Companies want to make money out of technology in which they have invested; researchers' funding is affected by the perceived usefulness of and public interest in their technology; market researchers gain publicity and customers by making bold predictions.

It is vital to keep a record of the sources themselves. The country of origin and the date alone are useful clues to interpretation. The same organisation may change its forecast dramatically in just half a year. This is particularly true of emerging technologies, where there is much speculation, and where a breakthrough in technology or a change in legislation could have a big impact.

Finally, all forecasts must be brought back to reality. It is tempting to extrapolate a growing trend. But this must always be related to more concrete facts. What does it mean in terms of the population, or in terms of what people earn? How does the forecast relate to the money that companies are actually investing? What benefit does the new technology offer over what people already have?

Forecasts for emerging technology are particularly speculative. The information analyst must be prepared to question the material, and to revise their picture of the market.

3. The research environment

A research laboratory is looking ahead to the future of the company. It develops technology which will be used in new products. Researchers are primarily concerned with the technology itself. In addition, they have a need to back up their research with a business case. At any one time, an industrial laboratory will have a variety of projects at different stages of development. These range from speculative explorations, the results of which may not be of use to the company for another 5-10 years, through to projects which are close to or actually transferring technology to a product Division. The needs for market information vary from one stage to another. All projects have one thing in common: the need to project the demand for the technology they are involved in. All are concerned with future products and growth for the company. Even a project in the most advanced stages of technology transfer has to consider the market needs several years into the future.

To support these needs, an information service can track sources of information pertinent to the technologies under development. It must also respond to specific requests. A request may be technology-based. It may be product-based. The need for information of this sort is often immediate. The task in this case is that of collecting information, assimilating it and presenting it in an appropriate form. The information worker acts as information gatherer and consultant to a project.

4. What information is required?

The business needs of a research project vary according to its maturity. An early speculative project will want to generate a broad-brush but compelling picture of the need for new technology. The information needs at this stage could include demographic or customer information; or current market figures and projections for a set of products which the new technology aims to improve or replace. A more mature project may be making the case for a new business for the company; or it may be working with a manufacturing Division on the application of new technology into new products. At this stage, a research project is working more closely with product developers. The researchers and their partners have a firmer idea of what products and services the company could produce.

Past, present and future all hold important clues. Historical data can show the rate of adoption of comparable technology in the past. Awareness of perennial problems, such as how to extend the customer base beyond early technology adopters to the wider market, comes from looking at past cases and experience. For example, Geoffrey Moore's *Crossing the Chasm* identifies the 'Technology Adoption Life Cycle', and uses examples to illustrate high-tech companies' success or failure in acquiring mainstream customers. The new technology may, for instance, be targeting a particular geographical region. For example, providers of new technology for telecommunications may consider the history of adoption of existing technology in North America, in order to understand the demand for new networks in developing countries.

A picture of the current market is essential. Which companies are involved? Who are the current and future customers, competitors and partners? What are they doing, and where? What are their plans? An understanding of today's market helps to focus the future forecast, and to work out where the company can make money.

Data on the past and present provide a useful information base. They also serve as a reality check on existing forecasts. However, a research laboratory is concerned with the future. For any technology which is under development, or which the company is considering for a research activity, there must be an account of how this could make money for the company. This means looking at the market for products and services which could use the technology, or which could be enabled through the new technology. The types of information which aid this study include:

Published forecasts;
Expert opinions;
Forthcoming legislation;
Demographics;
Patents;
Economics.

The requirement may be to identify new markets to be enabled by the technology; it may be to look at trends in existing products, to which the company intends to add value. An example of this may be to forecast the population of computers for which the company plans to develop a software application.

The questions are: how big will the market be? How much can we target for ourselves? What influences are there which might affect this forecast?

5. What information sources are available?

There are plenty of consultants and organisations ready to predict the future and to provide the latest news. A few examples are described below.

Market research reports

Published market research is major source of information. It predicts trends over time. The reports often contain historical data as well as future projections. They also have an explanation of their techniques, of their own sources, and of how they view the market. These are usually the most detailed documents which deal with the future. They are also among the most expensive. They may have been commissioned or purchased by the company. For any study, the more views you can get, the better. If there are several forecasts for the same market, you can look for consensus, or for obvious differences. If there is only one forecast, there may be a reason why no-one else is sticking their neck out. The more mature the market, the larger the number of forecasts.

Online databases

Online searches can look for keywords, often with Boolean logic for more sophisticated searches. These can search for news articles; for information about companies; and for titles and abstracts of papers. Intellectual property databases can be searched for patents. Besides specific searches, alerts can be set up on some of these databases, to inform the researcher of - for example - new developments in technology.

Some agencies offer news feeds. These can be ready-filtered, or they can be searched using keywords.

Periodicals

Newsletters and journals abound. Some of these are free. Most are not. Regular publications such as these can offer updates on the subjects covered by market research reports.

Electronic sources

Electronic sources are particularly useful. Depending on the licence agreement, these can cut down on the effort of converting numbers into a usable format, such as tables or spreadsheets. Some journals are now available in electronic form. *Information Week* and the *Telecomeuropa* journals are examples of this.

An electronic table of contents service is useful for journals which an organisation does not want a full subscription to, but which occasionally have articles of interest to the researchers. This service is particularly useful for highly specialised or peripheral research areas.

Electronic bulletin boards are becoming available. These are not always easy to find out about. But a good one can provide a ready filter for your particular area of technology. Many companies, government departments and other bodies which collect information have started to put pages on the World Wide Web.

Other sources

Main trends are often published less formally. For example, the big numbers from a new report appear in the press. There will not be any detail. But it provides another view. Similarly, companies sometimes offer their view of the future, or of the current market, either in a specialist publication, or in their own annual reports.

The information analyst needs to have exposure to as many sources of data as possible. Then they can discriminate. A couple of months of browsing reveals which newsletters provide the most comprehensive coverage; who gets the news first; where to find data in the most usable format; and which sources are most often quoted by others.

6. Conclusion

This paper has concentrated on the use of information services to support technology forecasting.

Forecasting for research means dealing with a large factor of uncertainty. The forecaster is looking several years ahead. The information specialist supporting this activity must get to know their sources of information, and must be prepared to investigate the assumptions and bias underlying them. The important thing is to look for the big picture, rather than for precise numbers. Forecasts from market research companies provide views into the future. Past and current data can complement this to provide context and a reality check.

7. References

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