Improving forecast quality in practice

Introduction
by Robert Fildes (Lancaster Centre for Forecasting)

Forecasting in Government
by Tom McBride (Audit Manager, National Audit Office)

Building a Forecasting and Planning Centre of Excellence
by Anita Tadayon (S&OP Director, Home Service & Supply, BSkyB)

How does forecasting add value to your business and what can be done to improve it?
by Steve Morlidge (Product Director, CatchBull)

Panel Discussion
Services
• Training courses and tutorials
• Consultancy and research projects
• Mentoring and tutoring
• Knowledge-transfer partnerships
• Custom-made methods
• Systems auditing and tuning
• MSc summer projects

Forecasting for...
• FMCG
• Electricity and Utilities
• Call-centres
• Government
• Pharmaceutical products
• Spare parts
• Promotional effects

Prof. Robert Fildes
Dr. Sven Crone
Dr. Nikolaos Kourentzes
Dr. Nicos Pavlidis
Dr. Gokhan Yildirim
Dr. Fotios Petropoulos
Agenda

• The Forecasting Process
• Dimensions of quality
• How to go about auditing?
• Where are improvements likely to arise
  – Results of the survey
• Pointers
Demand Planning
Supply Planning
Reconciliation of plans

Finalise S&OP: link to implementation

Forecasting Process

Data Base
External Info & Market Intelligence

Statistical Forecast
Judgmental Forecast
Functional Forecast

Forecasting System
- Model A
- Model B

Monthly Process
Finance/Commercial

Reconciling ‘supply’ with demand

Demand Planning
Supply Planning
Reconciliation of plans
The process (Sales and Operations Planning)

- Statistical forecast
- Information from sales, market research, planning and logistics
- Incorporated into a final forecast from the forecasters back to interested parties
- Judgment is a key component
Key findings:

- judgmentally based methods more used than objective methods
- complex methods used less than simple methods

Table V. Forecasting techniques ranked in order of frequency of use across forecasting horizon

<table>
<thead>
<tr>
<th>Technique</th>
<th>Short horizon ≤3 months</th>
<th>Mid horizon 4 months–2 years</th>
<th>Long horizon &gt;2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M&amp;C  M&amp;K  PS</td>
<td>M&amp;C  M&amp;K  PS</td>
<td>M&amp;C  M&amp;K  PS</td>
</tr>
<tr>
<td>Simulation</td>
<td>11      12  na</td>
<td>10     13  10</td>
<td>6      8  na</td>
</tr>
<tr>
<td>Life cycle analysis</td>
<td>12      12  6</td>
<td>12     10  11</td>
<td>5      5  na</td>
</tr>
<tr>
<td>Decomposition</td>
<td>9       8   6</td>
<td>9      7   8</td>
<td>na      na  na</td>
</tr>
<tr>
<td>Box–Jenkins time series</td>
<td>10      8   na</td>
<td>11     11  11</td>
<td>11      12  na</td>
</tr>
<tr>
<td>Expert systems</td>
<td>nm      12  na</td>
<td>nm     13  11</td>
<td>nm      11  6</td>
</tr>
<tr>
<td>Neural networks</td>
<td>nm      8   na</td>
<td>nm     12  11</td>
<td>nm      13  na</td>
</tr>
</tbody>
</table>

Notes: M&C, Mentzer and Cox (1984), sample size = 160; M&K, Mentzer and Kahn (1995), sample size = 186; PS, present study, sample size = 86; nm, not measured in the study; na, not applicable (no respondents indicated use of the technique for that time horizon).
How are forecasts typically produced?

<table>
<thead>
<tr>
<th>Method</th>
<th>Fildes &amp; Goodwin 2007</th>
<th>This survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Judgment alone</td>
<td>25%</td>
<td>14%</td>
</tr>
<tr>
<td>ii) Statistical methods exclusively</td>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td>iii) An average of a statistical forecast and management judgmental forecast(s)</td>
<td>17%</td>
<td>19%</td>
</tr>
<tr>
<td>iv) A statistical forecast judgmentally adjusted by the company forecaster(s)</td>
<td>34%</td>
<td>37%</td>
</tr>
</tbody>
</table>
Steps in improving forecast quality

• Auditing the current forecasting activities
  – Purpose, horizon, information, value
  – Evaluation: the accuracy record (PHIVE)
  – Benchmarks

• Establishing the current forecasting process
  – Who does what, with what resources?
  – What information is available?
  – Where do errors creep in?
    • Other people’s information
  – Internal judgment calls

• Areas for improvement
  – Resources (people, software, data base)
  – Techniques
  – Information flows
Audit performance – why?

- Need to know if current performance is good, bad or indifferent in order to decide priorities for improvement.

- Measures need to be related to the organisation's performance objectives.
  - Standard KPIs may not make sense.
  - Impact on organization.

- Questions for any proposed performance measure:
  Does it help...
  - to identify why the problem occurred?
  - to correct or mitigate them (not find who to blame)?
Applying benchmarking to Forecasting
Creating an improvement plan

- Goals, objectives
  - Horizon, level of aggregation (e.g. national, regional), updating

- Scope and responsibilities
  - Sales, finance? Or just the analysts
  - Who carries the can?

- Resources
  - Software a given? Staffing? Data systems?

- Critical success factors
  - Areas of weaknesses in current performance

- Performance measures
  - Evaluation, how measured
Industry standards in forecasting

Dimensioning the Forecasting Process & UNDERSTANDING YOUR OWN PROCESSES

Based on a work carried out by John Mentzer & colleagues on 34 US companies (Moon et al, Int. J. Forecasting, 2003)

• Functional integration in the Organisation (S&OP in supply chain)
  – collaboration and co-operation between the forecasting team and other business functions
  – link with decision making/planning

• Systems
  – data base
  – software
  – support
  – feedback and organisational learning

• Technical approach
  – problem specification, e.g. level of disaggregation, time horizon
  – techniques
  – evaluation and KPIs (accuracy)
Problems with a Company

- Data
- Data-user interface
- The Forecasting Support System
- Motivation & Training of Key Personnel
- Technical support
- Information flows (and linkages) from other departments
- Lack of time (and resources)

**Need for systems:**
- accurate statistical methods
- easy-to-use
- easy-to-understand
- incorporate judgement
- incorporate drivers

*Forecasts are Frequently Politically Modified*
- In a US survey, 60% thought this damaged accuracy
“A good forecasting system leads to improved decisions”

What’s to be done? Improve!

- Forecasting Techniques
- Information flows and the organisation of forecasting
- Forecasting resources and the information system
## Improving forecasting


<table>
<thead>
<tr>
<th>Activity</th>
<th>Respondents Scoring Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing consistent data</td>
<td>83%</td>
</tr>
<tr>
<td>Increased software support</td>
<td>70%</td>
</tr>
<tr>
<td>Improved techniques</td>
<td>66%</td>
</tr>
<tr>
<td>Improved data bases</td>
<td>61%</td>
</tr>
<tr>
<td>Improved communication with users</td>
<td>35%</td>
</tr>
</tbody>
</table>
Potential problem areas that get in the way of improving the quality of business forecasting.

- Organization/Information
- Systems
- Resources
- Techniques
- Evaluation

Sample size: 41
**Systems**

- Availability and accessibility of an integrated data base
- Over-reliance of Excel in producing our forecasts
- Quality of forecasting software available to use (where forecasts are not Excel based)

**Resources**

- Lack of training in the forecasting team
- Volume of forecasts need to dealt with
- Quality of technical support to overcome problems
Techniques

Quality of judgmental interventions made by the forecasting team

Limitations of the statistical models

Evaluation

Measuring the accuracy/value of the forecasting activity
Information sharing

- Sales: 80%
- Marketing: 57.1%
- Finance: 40%
- Production: 40%
- Marketing Research: 20%

Other: Purchasing / Supply, Planning and Control (Logistics), Revenue Growth Management
Means of collaboration

**Internal**
- E-mail: 88.6%
- Meeting: 74.3%
- Conference call: 54.3%
- Dedicated software: 42.9%
- Conference: 22.9%
- Other: 14.3%
- Not relevant: 2.9%

**External**
- E-mail: 77.1%
- Conference call: 34.3%
- Meeting: 28.6%
- Dedicated software: 17.1%
- Conference: 17.1%
- Other: 11.4%
- Not relevant: 20%
Principal objective:
Production of accurate forecasts, given the available resources

Other objectives: Timeliness, Stock availability, Stability of forecasts, ...
Evaluating an organisational design

• Forecaster and Decision Maker
  – responsibilities for data, forecasting & innovation

• Information Flows
  – from the environment
  – intra-organisational flows and loss of information

• Technical Characteristics of the forecast
  – accuracy and bias
  – responsiveness and speed
  – uncertainty

The forecasts aren’t used
The information is not there
Poor techniques are employed and we don’t understand how bad they are
Why don’t we adopt better forecasting processes?  
Barriers to adopting new procedures

- Compatibility with existing practices
- Divisibility
- Communicability and complexity
- Riskiness
- Managerial factors  + value of new procedure
  - Top-management
  - User-designer relationship
  - Implementation strategy
  - Environmental events
Improved forecasting is achieved by:

• Improved information flows

• Using new techniques and processes
  – with the associated software

• Support systems to encourage effective inclusion of judgment

• Effective organisational links

• Trained, motivated and better resources managers

✓ forecasters with too much to do produce worse forecasts!
Takeaways

• Specify forecasting problem
  – Level of aggregation & Forecast horizon
  – Available information

• Data base
  – IS and common accessible data base

• Current accuracy
  – Compared to base line method on your data
    • Exponential smoothing, Naïve
  – Appropriate measures?
  – Value-added analysis of judgment?

• Software choices
  – Benchmarked statistical methods

• Implementation and Improvement Issues

Workshop Aim: To consider paths forward for you/ your company to improve your forecasting processes
The basic idea is to determine the processes in your company that could or should be improved. This is to be achieved by:

- finding out organizations might be doing better,
- finding the gap between their performance and yours, investigating how they carry out the processes,
- finally, make changes to bring you up to their level.

**Types of auditing**

- **Internal**: between operations or parts of operations within same total organisation
- **External**: between operations that are parts of different organisations
- **Non-competitive**: against operations in organisations that are not direct competitors
- **Competitive**: compare with direct competitors
- **Performance**: comparing levels of achieved performance
- **Processes**: comparing your way of doing things with the way used by others to see if can learn from their practices

Requires co-operation and exchange of data, directly or through third party.
Factors in forecasting auditing

- Key Variables
- Information sources
- Methods
- Accuracy
- Organisational importance, motivation and credibility of forecasting
- Environmental uncertainty
  - competitive pressures, e.g. new products & services, promotional intensity
- Forecasting process
Auditing organisational and motivational issues

| Organisational Importance given to Forecasting | 5 (very important) |
| Credibility Attached to Forecasts by Senior Managers | 4 |
| Importance in Planning | 4 |
| Priority given to Forecast Improvement by Top Management | 4 |
| Integration across functional areas | 3 |
Takeaways II

• Additional information valuable?
  – Market information
    • Is it collected and stored effectively?
    • Can it be analysed?

• Software choices
  – Good statistical methods
  – Benchmarking against ‘best practice’ alternatives
  – Easy-to-use reporting and analysis capabilities

• Implementation and Improvement Issues
  – Next steps to improve accuracy?
  – Is the forecasting process designed to lead to improved accuracy?
  – Is accuracy monitored?
  – What’s the staff’s motivation to improve accuracy?
  – What extra resources/skills do you need?

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