Operational Research – The Science of Better

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What is Operational Research (OR)?

OR is the discipline of applying appropriate analytical methods to help those who run organisations make better decisions. It’s a ‘real world’ discipline with a focus on improving the complex systems and processes that underpin everybody’s daily lives – OR is the ‘science of better’.

“Quantitative common sense”

--- Sir Charles Goodeve
### John Hopes – a personal history

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<th>Where</th>
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<th>Doing What?</th>
<th>OR examples</th>
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| Shell    | 1979-1988  | • Operational Research  
                         • Strategic Planning  
                         • Production Economics | Coal terminal simulation    |
| KPMG     | 1988-2001  | • Management Science  
                         • Decision Systems  
                         • Business Modelling  
                         • Customer Management | Call centre simulation     |
| EY       | 2001-present| • Business Modelling                                  | Field force planning         |
| OR Society | 2011-present | • Vice President                                   |                              |
Science of better

OR value proposition

► Decision making : assess decision alternatives
► Forecasting : basis for accurate forecasting and planning
► Pricing : dynamic pricing of products and services
► Recovery : greater control and achieving faster turn-around
► Quality : quantifying and balancing qualitative decisions
► Risk : measuring risk quantitatively
► Throughput : decreasing delays
► Business insight : quantitative business insight into complex problems
► Cost reduction : new opportunities for cost reduction
► Profits : increase revenue and market share
► Resources : gain greater utilisation from limited resources
► Productivity : increase productivity
► Scheduling : improve scheduling and apply tactical planning
Case study: LNG scheme simulation

Design Parameters:
- Number and size of LNG carriers
- Volume of storage
- Number of berths
- Routing rules

KPIs:
- Queuing time
- Shut-in production
- Cost

Output:
- Scheme design to maximise NPV
Case study: Oil refinery LP

Inputs:
- Crude oils available
- Product demands
- Refining unit’s operating parameters
- Planned shutdowns

Outputs:
- Operating plan to maximise profitability (rates, cut points, etc.)
Case study: Revenue management

- Very large data sets
- Combines statistical analysis and optimisation
- Embedded in real time operational systems
- Delivers multi billions of dollars benefit per annum:

Example: American Airlines pioneered yield management after airline deregulation (1979) and the airline subsequently saw c.$1.4 billion dollars in additional revenue over a 3 year period

Forecasting
- Demand
- No shows cancellations

Market Segmentation
- Price sensitivity

Optimisation
- selling price
- inventory allocation
- revenue
Case study: New Zealand Post - Retail network optimization

EY developed a model that:
► Automatically optimises the network
► Visualisation by Geographic Information System
► Accounts for all financial and practical constraints

Background and delivery outcome
► Decline in traditional business
► Compensate by offering financial services
► 1600 current outlets, 5 current outlet types, 2 modes of ownership, 2000 potential new locations
► Annual profitability improved by tens of millions of dollars

Team Contributions
EY developed a model that:
► Automatically optimises the network
► Visualisation by Geographic Information System
► Accounts for all financial and practical constraints
Case study : Cost-to-serve

EY developed a powerful model that:
► Minimises present and future cost-to-serve
► Extensive scenario capability
► Tool being used by a number of manufacturers in the FMCG industry

Background and delivery outcome
► FMCGs must deliver high volume to retailers
► Complex high-cost operation
► Helped identify potentially millions of dollars annual benefit by:
  ► Understanding costs
  ► Identify cost-reduction opportunities
  ► Enable win-win outcomes
Case study: Health analytics

Capacity and demand:

► Understand current capacity levels at hospitals

► Improved demand planning

► Efficient theatre schedules and bed utilisation

► Analytic HES packs
  ► Specialty and HRG level analysis
  ► Identify potential reconfiguration
  ► Moving or closing services
Conclusion

“OR influences a whole range of decisions. Ours is a complicated business and OR thinking is critical to taking the right decisions. OR people often bring a different way of thinking about a problem that you don't see for yourself.”

---Roger Blackburn
Head of Strategy and Business Planning
British Airways

OR is the ‘science of better’