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AGENDA

• Introduction
• What is "Strategic MS/OR"?
• Methodology
  -- The first study of Edelman finalists 1989-1998
  -- Follow-up study of private sector finalists 1989-1996
  -- Follow-up study of public sector finalists 1989-1997
• Some findings from the research
• Implications for practice
• Conclusions

An objective of business strategy is to:

"create substantial and sustainable competitive advantage"
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**STRATEGIC MS/OR**

- **Definition:**

  MS/OR work that leads to a sustainable competitive advantage.

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**STRATEGIC MS/OR**

Most "quantitative analysis" appears to be easily replicated.

**Issue:** How then can MS/OR work create a sustainable competitive advantage?

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**APPROACHES TO SUSTAINABILITY**

- Have an internal MS/OR group that works on many different problems, or
- Invest in MS/OR work on a particular kind of "strategic MS/OR problem", or
- Market an "MS/OR product".

There is evidence of all three approaches in the literature.
AN EXAMPLE OF AN INTERNAL STRATEGIC MS/OR GROUP

“FedEx is an archetype of a company that has succeeded by applying the scientific methods to its operations. Models and analysis have informed many of FedEx’s crucial, business-shaping decisions. In cases in which OR wasn’t used ... the company performed poorly.”

[Mason et al., Waves of Change: Business Evolution Through Optimization]

STRATEGIC MS/OR PROBLEMS ARE:

- Problem areas where an MS/OR group can achieve a sustainable competitive advantage.
  - These are very large, high cost, problems that may be theoretically “optimizable”, but where the optimum solution cannot be found at the limits of today’s techniques and technology.

  MS/OR can continuously improve solutions for these problems by applying improved techniques and technologies over a considerable period of time.

STRATEGIC MS/OR PROBLEMS

Examples:
- Supply chain optimization
- Optimum dynamic pricing/revenue management
- Optimizing global manufacturing
- Crew scheduling in a large air carrier
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SUSTAINABILITY ARISES FROM TWO SOURCES:

1. The MS/OR group gains skills and technologies (perhaps also databases, rules, and code) which are not easily replicated, and
2. Management "tunes" the firm to take maximum advantage of the low cost solutions that MS/OR is developing. This may include structures, contracts, plant and equipment etc.

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MARKETING AN "MS/OR PRODUCT"

Many examples of firms that market MS/OR products:
Solutions: SABRE/Manugistics/PROS/Giro
Tools: ILOG/Simul8/CACI/Ketron
Mindware: SABRE/Vertico/Kearney/CG&E/Y

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First Study: RESEARCH METHODOLOGY

- Examine all private sector, Edelman prize finalists, 1990 - 1999
- Use dimensions of analysis from Strategic IS and strategic management
- Look for evidence of "Strategic MS/OR"
- Estimate IRRs where possible
Level of Management Support

• 25 of 30 projects were supported at corporate VP level or higher, 10 by the President, CEO, or Directors.
• 13 of these 25 applications were at a functional level.
• Functional level MS/OR can create an advantage of interest to senior management.

Evidence of Organizational Change from MS/OR Work

• 17 of 39 applications provide evidence of secondary organizational change,
  – 13 involve capital equipment purchases.

Conclusions from this first study

• 13 of 42 applications meet a definition of Strategic MS/OR based on creating a sustainable competitive advantage;
• 4 other applications appear to have contributed to a long-term advantage that resulted from several factors (including MS/OR);
  – P&G, GRI, KeyCorp, and Sainsbury.
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Conclusions from this first study

- In 12 of 42 applications, the MS/OR work appears to have had insufficient impact to be considered Strategic.
- In 9 other applications there was a large impact but this does not appear to be sustainable (“non-sustainers”)
  - Cerestar, Grantham, HP, L.L. Bean, Merit, PALCO, Taco Bell, Tata Steel, Yellow Freight System
- 1 Special case - Columbus-America.

Article is forthcoming in Interfaces

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Private sector follow up study: After the Edelman competition: What happened to the Finalist Applications?

- Sample selection
  - ALL private-sector Edelman finalists 1989-97
  - 34 applications from 28 corporations
- Telephone interviews
  - multiple interviews per firm
  - starting from authors
  - much detective work
- Recorded interviews, then transcribed, then interpreted/summarized

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Results from follow-up study

- Many structural changes (10/28)
- The MS/OR application
  - is still in use (27/34)
  - has been extended or improved (27/34)
  - has motivated other MS/OR applications (24/34)
  - observed organizational change (23/34)
- The MS/OR Group
  - individuals have been promoted to upper mgt (9/12)
  - OR people have increased (15/28)
Results from follow-up study

- **MS/OR**
  - part of the corporate culture (14/28)
  - spread in acceptance across firm (21/28)
  - considered critical to firm’s success (16/28)
  - more involved in firm decision-making (7/18)

- **Competitors**
  - observed competitive reaction (22/34)

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RESULTS: STRATEGIC MS/OR

- **Strategic MS/OR Applications**
  - The longitudinal evidence supports a view that the 12 original “strategic” applications are examples of “MS/OR that created a sustainable competitive advantage”
  - the follow-up study suggests that 8 other applications were more “strategic” than originally thought

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STRATEGIC MS/OR

- The 20 strategic applications
  - AT&T TM site selection
  - AT&T call simulator
  - ABB Electric
  - AA yield management, ASAS and TRIP
  - Delta COLDSTART
  - GE Capital (originally insufficient impact)
  - Home Corporation
  - IBM LMS (originally insufficient impact)
  -Incorrect
  - Incorrect
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The benefits of being “strategic”

• Still in use: 18/20
• Improved over time: 18/20
• Additional MS/OR work: 15/20
• Additional resources devoted to MS/OR: 13/20
• MS/OR part of the “corporate culture”: 14/20

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CONCLUSIONS FROM THESE STUDIES

• The Edelman applications have generally had a positive impact over a long period of time (>5 years) despite much structural change
• The great majority of Edelman finalist firms have continued to be heavy consumers of MS/OR - exceptions ABB, LL Bean
• The results generally support the “strategic MS/OR” concept/grouping

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INTERESTED IN MORE?

• OR/MS Today (June, 2001) has a “chatty” article with some stories,
• Interfaces article forthcoming,
• Operations Research article forthcoming.
• Summer of 2001 we contacted public sector Edelman finalists >5 years since publication.
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**Public sector follow-up study**

- Followed methodology of private sector follow-up study.
- Contacted 18 of 21 applications
- Most have multiple interviews.

- Issue: What is the equivalent of “strategic MS/OR” in the public/military sector?

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**Public sector MS/OR characteristics**

<table>
<thead>
<tr>
<th>Private sector groupings</th>
<th>Public/military equivalent</th>
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</thead>
<tbody>
<tr>
<td>Sustainers</td>
<td>Strategy: MS/OR applications that created a sustained advantage</td>
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<tr>
<td>Non-sustainers</td>
<td>Policy formulations: MS/OR studies that formulated lasting public policy</td>
</tr>
<tr>
<td>Insufficient impact</td>
<td>The benefits of the work were not large enough to be “strategic.”</td>
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<tr>
<td>Policy formulators</td>
<td>The benefits of the work were not large enough to be memorable</td>
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<tr>
<td>Stayers</td>
<td>Strategic MS/OR applications that were used regularly over a substantial period of time</td>
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<tr>
<td>Insufficient impact</td>
<td>Non-sustainers: Policy formulators that used MS/OR work that was not the essence of the decision</td>
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**Public sector follow-up study results**

**“Stayers”**
- HASTUS
- Hidroelectrica Espanola
- USPS
- USMA
- North Carolina School Transport
- SNCF

**“Policy formulators”**
- DRGs
- New Haven Needle Exchange
- SANDF
- UK National Health Service
- Kuwait al Manakh Stock Market
- Tritium supply

**“Insufficient impact”**
- New York City ATA (problem was solved and went away)
- China Coal planning
- Reshaping US Army
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STRATEGIC CHOICES FOR CORPORATE MS/OR GROUPS

1. "Chip away" at "strategic MS/OR problems" trying to make a contribution every year for several years.
2. Attack small problems but try to have an impact on a great number of those.
3. Market "MS/OR" either directly or spin out.

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Future Research

• If we can establish that MS/OR can be "strategic", then the future for MS/OR will be even brighter,
• There is a great deal of fairly obvious research to be done (following SIS),
• Business school MS/OR faculty should consider leading in this area.

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CONCLUSIONS

• Investing in MS/OR can be successful strategy,
• Some firms that have followed this strategy have had a major impact on their industries and competitors,
• MS/OR is now a "core competence" in a growing number of firms,
• Strategic MS/OR merits further investigation.