OR Practice in NORAM

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The Study

• Requested responses from various communities (Tech sections, societies, and SIGs) about their practitioner activities.

• Response very limited... Only 86 responses (73 US and 13 Canada)

• I will first present results of survey and then discuss what I believe is really occurring within North America
Age of Respondents (NORAM)
Application areas of your OR work (NORAM)
On-the-job training (NORAM)

- OR techniques
- Statistics
- Software packages
- Consultancy skills eg report writing, presentation skills
Usage of OR related software (NORAM)
Barries to the use of OR (NORAM)

- a) Staff
- b) Training
- c) OR software
- d) Computing hardware
- 3.42 Available staff lack required expertise
- 3.43 OR software inadequate/difficult to...
- 3.44 Data limitations
- a) Company cannot support in-house OR
- b) Company unconvinced of potential...
- c) Lack of awareness of OR
- d) Clients cannot understand OR methods
- e) Organisation culture not suited to use...
Approximate number of OR consultant/analysts across the organization (NORAM)
Usage of academic consultants (NORAM)

- International (N=71)
  - None
  - Occasional (1 to 3 times per year)
  - Frequent (>3)

- Local (N=73)
  - None
  - Occasional (1 to 3 times per year)
  - Frequent (>3)
Usage of external commercial consultants (NORAM)

- General management (international) (N=71)
- General management (local) (N=74)
- Specialist consultancy (international) (N=72)
- Specialist consultancy (local) (N=75)

- none
- occasional (1 to 3 times per year)
- frequent (>3)
Size of the Group (NORAM)
Number of employees in your organization NORAM
Now some data from INFORMS databases

• Tally of information from membership database about members of technical sections
• Here, data looks different and more encouraging about status of practice in US
**Societies are largest sub-organizations’**

**Total membership across societies = 7782**

**Of this total 22% declare their affiliation as “practice”**

<table>
<thead>
<tr>
<th>SOCIETIES</th>
<th>Total membership</th>
<th>% of Membership declared Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Probability</td>
<td>593</td>
<td>15%</td>
</tr>
<tr>
<td>Computing</td>
<td>507</td>
<td>27%</td>
</tr>
<tr>
<td>Decision Analysis</td>
<td>1182</td>
<td>30%</td>
</tr>
<tr>
<td>Information Systems</td>
<td>519</td>
<td>10%</td>
</tr>
<tr>
<td>Mfg and Serv Org Mgt (MSOM)</td>
<td>1197</td>
<td>10%</td>
</tr>
<tr>
<td>Marketing Science</td>
<td>880</td>
<td>13%</td>
</tr>
<tr>
<td>Military Application</td>
<td>455</td>
<td>51%</td>
</tr>
<tr>
<td>Optimization</td>
<td>919</td>
<td>25%</td>
</tr>
<tr>
<td>Simulation</td>
<td>551</td>
<td>34%</td>
</tr>
<tr>
<td>Transportation Science</td>
<td>968</td>
<td>18%</td>
</tr>
<tr>
<td>TECHNICAL SECTIONS</td>
<td>Total</td>
<td>% Practice</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
<td>99</td>
<td>31</td>
</tr>
<tr>
<td>Aviation Applications</td>
<td>337</td>
<td>23</td>
</tr>
<tr>
<td>Behavioral Process Mgmt</td>
<td>122</td>
<td>30</td>
</tr>
<tr>
<td>CPMS (Practice of Mgt)</td>
<td>233</td>
<td>62</td>
</tr>
<tr>
<td>Data Mining</td>
<td>225</td>
<td>41</td>
</tr>
<tr>
<td>eBusiness</td>
<td>91</td>
<td>18</td>
</tr>
<tr>
<td>ENRE</td>
<td>245</td>
<td>36%</td>
</tr>
<tr>
<td>Financial Services</td>
<td>187</td>
<td>30%</td>
</tr>
<tr>
<td>Group Dec and Negotiation</td>
<td>122</td>
<td>43%</td>
</tr>
<tr>
<td>Health Applications</td>
<td>419</td>
<td>20%</td>
</tr>
<tr>
<td>Location Analysis</td>
<td>327</td>
<td>11%</td>
</tr>
<tr>
<td>Organizational Science</td>
<td>231</td>
<td>12%</td>
</tr>
<tr>
<td>Public Programs, Services, Needs</td>
<td>82</td>
<td>41%</td>
</tr>
<tr>
<td>Quality, Stats, Reliability</td>
<td>225</td>
<td>19%</td>
</tr>
<tr>
<td>Railway Applications</td>
<td>219</td>
<td>20%</td>
</tr>
<tr>
<td>Revenue Mgmt and Pricing</td>
<td>293</td>
<td>28%</td>
</tr>
<tr>
<td>Service Science</td>
<td>224</td>
<td>12%</td>
</tr>
<tr>
<td>SpORts</td>
<td>286</td>
<td>14%</td>
</tr>
<tr>
<td>Spreadsheet Productivity Research</td>
<td>545</td>
<td>33%</td>
</tr>
<tr>
<td>Technology Management</td>
<td>205</td>
<td>22%</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>251</td>
<td>22%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>4968</td>
<td><strong>26%</strong></td>
</tr>
</tbody>
</table>
What are the new Practice initiatives?

• Analytics

• Social Networking
Analytics

WHY? Because it means something to the non OR specialist.

INFORMS sees OR as doing “advanced analytics” in addition to other activities... medical diagnosis, algorithmic advances, economic theory, etc.

• INFORMS started a magazine for executives that was recently renamed “Analytics”
• The analytics section was recently formed and has over 300 members
• “Practice” meeting relabeled “Analytics”
Why Analytics?

• Many firms are awash in data
  – Enterprise Resource Planning (ERP) Systems provide voluminous business data
  – The internet offers customer and market data and the opportunity to experiment with different product, promotion, and pricing plans
  – RFID devices will be placed on virtually every pallet or carton generating vast amounts of new data

• These trends are leading firms to use and analyze data to improve business performance and make better decisions

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Advanced Analytics
is the use of data and models to provide insight to guide decisions

Data sources:
- Business automation
- Instrumentation
- Sensors
- Web 2.0
- Expert knowledge
  “real world physics”

Model:
a mathematical or algorithmic representation of reality intended to explain or predict some aspect of it

Informed Decisions

Decision executed automatically or by people
Why focus on Business Analytics & Optimization and why now?

<table>
<thead>
<tr>
<th>The information environment is at a tipping point</th>
<th>To survive, business leaders must act</th>
<th>Today's enterprise has not kept up and cannot keep up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional transactional and human-authored enterprise data is rapidly growing</td>
<td>People at all levels need better information and executives need to make decisions more quickly</td>
<td>Decision making is based on instinct, subjective information, and often the wrong facts</td>
</tr>
<tr>
<td>Unstructured data is growing at geometric and exponential progressions, and most of it is not used in analytics</td>
<td>Decisions need to be made based on a new set of facts based on the entirety and richness of the information base</td>
<td>Existing tools cannot access or analyze the growing data effectively and aren't positioned to handle the data deluge</td>
</tr>
<tr>
<td>The unblinking eyes of instruments and sensors is producing tireless streams of new data</td>
<td>Mental bandwidth needs to be reallocated towards harder and more pressing decisions</td>
<td>Huge amounts of data are ignored, mismanaged, or under-utilized</td>
</tr>
</tbody>
</table>

We are approaching a “do or die” moment: enterprises that act on the opportunity will survive to prosper, and those that don’t will be lost.
Today’s marketing information and analysis environment is more complex than ever, and ever more critical to success

- “Data” regarding customers has increased (but true “knowledge” of the customer has not increased)
- Organizations are better able to access that data (huge amounts; often too much)
- Opportunities for quick-wins using that data have been realized (by you and your competition)
- Customers also have better access to data, are provided more choices, and recognize more competitive options

The heavy lifting to modernize legacy systems has been completed, the “low hanging fruit” has been picked, but competitive forces continue to grow . . .
Summary
Advanced analytics extends from the domain of science & engineering to the world of business presenting a significant opportunity for all industries including Financial Services.

- Advanced Analytics is fueled by the availability of data, computational power and the need to make better choices.
- IBM is positioned for leadership in the new era of data-driven business management.
- IBM's Advanced Analytics and Optimization capabilities are unique in the marketplace.
- Our collaboration with clients is enabling discovery in new areas.
- Significant research opportunity remains.
Example: Harrah’s Entertainment

• Customer loyalty card data used in near-real time to optimize yield, set prices for slots and rooms, and design traffic through the casinos
  – Predict the “pain point” and pull you away from the slot machine

• Which marketing initiatives to move through which channels

• HR analytics used in recruiting process

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Example: Vanguard

- Dashboards have non-financial metrics and line of sight that roll up to a corporate dashboard to drive outcomes
- Customer analytics is a major focus where data mining is used to score clients and track problems
- Six sigma and analytics combined to improve business processes

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Example: Wyeth

• “metrics feed strategy and strategy feeds metrics”
• Ten high level enterprise metrics are integrated and reviewed by the CEO and top management
• Analytics and six sigma help to manage and improve all of their global processes: innovation, sales and marketing, supply chain, management, support

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Example: KPMG

• Metrics are key and help to understand how strategy is being executed
• Focusing on “electronic data discovery” – how to build associations across data
• Examples: bad debt chasing, payroll process, SOX audit controls in vendor sourcing and pricing, fraud discovery

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Example: Consulting

• Analytics used in corporate finance, economic consulting, forensic and litigation consulting, as well as brand management and strategic communications in general
• Focus on leading and predictive metrics

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Example: Nordstrom

- Analytics used at store level for merchandising (ID trends/styles), and by upper management to track customer interactions
- Heavy use in determining who should receive emails and catalogs in their multi-channel operation
- Lots of “test versus control” uses in the Direct Marketing aspects of their business
- Scorecards used to measure performance of new predictive models against current ones

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Example: Colgate

• Use data (financial, sales now R&D, shared services coming) generated from global ERP system to run the company
• Most managers can “drill down” into data to answer questions like “what did we buy today”
• Measure the back end of sophisticated marketing promotions to see what part worked

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Example: Marriott

- Marriott Rewards used analytics to predict customer acquisition and retention
- Realized, expected, and potential customer value is measured
- Predict each customer’s likelihood of visiting a location on a weekday or weekend in the next year

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What Business Leaders Are Saying...

• “In God we trust, all others bring data”
• “Do you think that, or do you know that?”
• “We are basing our strategy on analytics, especially customer analytics”
• “We cannot find enough new grads with the right quantitative skills”
• “We compete on the basis of better knowledge of their customers, using analytics”
• “The riskier our business problems the more we rely on analytics”
• “After implementing our ERP system we are mining that data, and using data better in different ways”

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Other Major Initiative: Social Networks

• Creating subgroups within LinkedIn
  – How many people have joined the INFORMS group on LinkedIn? .... Over 5500

• “OR Exchange” is now hosted and sponsored by INFORMS. The site allows users to post and answer question about O.R. topics.

• How are sites being used?
  – Technology questions answered
  – Advice about jobs and schooling
  – Announcements about events
  – References to articles, papers, and blogs on OR subjects
  – Arguments about what is important/new/best
Questions?
Years in the organization (NORAM)
Your Personal Understanding and Use of OR and related techniques
Top 8 techniques (NORAM)
Your Personal Understanding and Use of OR and related techniques

Next 8 techniques (NORAM)
Turnover of your organization (NORAM)

N=68
Society / Section membership sorted by number of practice affiliated members