April, 2012
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Innovation in Decision Sciences

Depending on which school of thought one belongs to, the current era can either be characterized as a vicious cycle or a virtuous cycle of data explosion, expanding applications, advancement of techniques and increasing technology complexity. It is hard to say what is driving what but the cycle is exacerbated by nature of businesses and the problems they are encountering. Continuous business transformation is a reality that defines the business problem space. Today there is an exponential increase in the number of problems that a business faces. This is triggered by emergence of new business models, cross-linkage across value chain boundaries, competition, regulation, etc. Further, yesterday’s business problems are disappearing and there is an increasing number of high-impact, complex but short duration business problems. In such a situation organizations are faced with the imperative of innovation in their problem solving and decision support methods. In this article we will focus on three broad areas of innovation that we see as emerging in the area of decisions sciences.

Interdisciplinary Approach

As companies adopt analytics as the new science of winning, organizations will need to focus both on the creation and consumption of insights to enable better decisions.

The creation of insights requires a holistic perspective of DIPP™ i.e. Descriptive Analytics, Inquisitive Analytics, Predictive Analytics and Prescriptive Analytics:

- **Descriptive analytics** answers the questions “What happened in the business?” It is looking at data and information to describe the current business situation in a way that trends, patterns and exceptions become apparent.
- **Inquisitive analytics** answers the question “Why is something happening in the business?” It is the study of data to validate/reject business hypotheses.
Predictive analytics answers the question “What is likely to happen in the future”. It is data modeling to determine future possibilities.

Prescriptive analytics is the combination of the above to provide answers to the “so what?” and the “now what?” questions. For example, what should I do to retain my key customers? How do I improve my supply chain to enhance service levels while reducing my costs?

Counter to the traditional thinking that organizations evolve from Descriptive to Inquisitive to Predictive to Prescriptive analytics, all four kinds of analytics have to be done in the right mix. Organizations that focus on only one aspect of the DIPP™ framework will fail in generating the right insights and recommendations.

However creation of insights alone is not sufficient. Going forward, companies will compete, not so much on the creation of insights, but rather on the consumption of insights. Consumption of insights entails communicating insights, implementing insights, measuring, incentivizing and developing cognitive repairs. It refers to the planned, ongoing use of a set of interlocking business practices and competencies that collectively delivery superior value from analytics insights. Enabling consumption will need an appreciation of behavioral sciences and how organizations and human beings absorb new and often counter-intuitive insights and process them to adjust their cognitive machines to make decisions. It will also require the integration of aspects like usability, visualization, anthropology, etc. in the process of creation and consumption of insights.

Thus the future of analytics and decision sciences will not just be based on applied math, business and technology, as it is today. The future will witness decision sciences encompassing Math + Business + Technology + Behavioral Sciences.

Yesterday
- Business + Technology allowed us to simply automate

Today
- Math + Business allows us to more cogent arguments at the board room
- Math + Technology allows us operate proactively with anticipation
- Math + Business + Technology allows us to execute better

Tomorrow
- Math + Business + Technology + Behavioral Sciences will let us develop nudges (cognitive repairs) against biases that we as human beings are gifted with
Discovery Driven Approach in addition to Problem Driven Approach

Daniel Kahnemann, the Nobel Laureate, in his book ‘Thinking Fast and Thinking Slow’ highlights that the human cognitive machine has evolved two systems of thinking: System 1 and System 2. System 1 is intuitive and fast but prone to cognitive bias, while System 2 is analytical, slow but prone to “analysis paralysis”. Making effective decisions require the synergies of both systems, with the ability to decide which system to use under any given circumstance/situation.

<table>
<thead>
<tr>
<th>System-1: Thinking Fast ...</th>
<th>System-2: Thinking Slow ...</th>
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<tbody>
<tr>
<td>Operates automatically and quickly, with little or no effort and no sense of voluntary control</td>
<td>Allocates attention to the effortful mental activities that demand it, including complex computations.</td>
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<tr>
<td>Continuously constructs a coherent interpretation of what is going in the world at any instant</td>
<td>Good at balancing probabilities and possibilities but is saddled with a key weakness - it is not always decisive (‘analysis paralysis’)</td>
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<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Domain-specific automatic processor</th>
<th>General-purpose rational processor</th>
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<tbody>
<tr>
<td></td>
<td>Quick (or Reflexive)</td>
<td>Deliberate (or Reflective)</td>
</tr>
<tr>
<td></td>
<td>Heuristic based</td>
<td>Conscious</td>
</tr>
<tr>
<td></td>
<td>Relies on ‘short-cuts’</td>
<td>Rule-based</td>
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<table>
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<tr>
<th><strong>When does it come into play</strong></th>
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<tr>
<td>Intuitive answers to problems where speed of reaction is important</td>
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<tr>
<td>To avoid decision paralysis, when System-2 reaches a state of cognitive overload</td>
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| Takes over when System-1 cannot process the data |
| Capable of correcting/overriding System-1 if it is convinced that the intuition is wrong |

Problem Driven Approach

In this context, use of data, or in simpler terms “observations”, help individuals and organizations hone their System 1 and System 2 abilities. Conventionally, most organizations look at analysis and data only when they have to solve a business problem or address a business priority. This problem specific way of looking at data is a method that starts from definition of the business problem, proceeding to identification of factors affecting the business problem, leading to hypotheses, which get tested on data to derive insights and recommendations. This approach relies on structured analytical thinking. It helps hone the System 2 part of the brain and is easier to enable in an organizational context, since data and analytical investments are in service of a business case.
One set back to this approach is that it can be myopic.

Steven Johnson in his book, "Where Good Ideas come From" highlights that innovation is facilitated by habitats that encourage exploration based on hunches, enabling connections of ideas in liquid environments while allowing reuse of prior knowledge and encouraging the freedom to err and fail. In contrast, the problem driven approach by its very nature is constricted and lowers the potential to discover opportunities. What is needed is an approach that starts with agenda-less observations and exploratory analysis that can lead to hunches, pattern discovery and generation of new ideas and opportunities. This discovery driven approach is also critical to honing System 1, which entails looking at large amounts of information and building an internal anticipation repository that feeds intuition. However organizations are usually reluctant to follow the discovery driven path since ROI is un-predictable.

To sum it up, helping organizations make better decisions is a mixture of art and science. Organizations will need to traverse the design thinking path from Mystery to Heuristic to Algorithmic in their endeavors to solve business problems and spot opportunities. Leveraging and navigating this duality between problem-driven and discovery-driven methods will be critical to success.

**Inter and Trans firewall analytics**

Over the last 100 years, supply chains have evolved to connect multiple companies and enable them to collaborate to create enormous value to the end-consumer via concepts like CPFR, VMI, etc. Decision sciences is witnessing a similar trend as enterprises are beginning to collaborate on insights across the value chain. For instance, in the health care industry, rich consumer insights can be generated by collaborating on data and insights from the health insurance provider, pharmacy delivering the drugs and the drug manufacturer. In-fact, this
is not necessarily limited to companies within the traditional demand-supply value chain. For example, there are instances where a retailer and a social media company can come together to share insights on consumer behavior that will benefit both players. Some of the more progressive companies are taking this a step further and working on leveraging the large volumes of data outside the firewall such as social data, location data, etc. In other words, it will be not very long before internal data and insights from within the fire-wall is no longer a differentiator. We call this trend the move from intra- to inter and trans-firewall analytics. Yesterday companies were doing functional silo based analytics. Today they are doing intra-firewall analytics with data within the firewall. Tomorrow they will be collaborating on insights with other companies to do inter-firewall analytics as well as leveraging the public domain spaces to do trans-firewall analytics.

Doing inter-firewall and trans-firewall analytics is not without its challenges. Firstly as one moves outside the firewall the information to noise ratio increases putting additional requirements on analytical methods and technology requirements. Further, organizations are often limited by a fear of collaboration and an over-reliance on proprietary information. The fear of collaboration is mostly driven by competitive fears, data privacy concerns and proprietary orientations that limit opportunities for cross-organizational learning and innovation. While it is clear that the transition to inter and trans-firewall paradigm is not easy, we feel it will continue to grow and at some point, it will become a key arsenal available for decisions scientists to drive disruptive value and efficiencies.