K. J. Somaiya Institute of Management Studies & Research

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Quantinuum Newsletter

Quantinuum - The Quants Forum

Its all about NUMBERS...

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JANUARY 2012 VOLUME 3:ISSUE 1

From the Faculty's Desk...

Hi All,

We had an eventful annual day on 28th January, when we had organized a Quiz competition and a workshop on Analytics. We went national with the quiz and we are happy with the outcome of our first national effort. We will be building on this further through our sustained future efforts. Thanks to all those who worked for it and made it a success. All of us realized that what all it called for was a firm commitment from a few. This I think is sufficient. During February, we are again marking our presence in Melange 2012 and also ICON 2012. Please be there to cheer us.

I am happy to introduce some new features in which we appreciate the efforts of some of our colleagues especially when they get recognized elsewhere. Mr. Sayak Gupta's article accepted for publication by MBASkool.com has been summarized for the benefit of our readers. Let us all congratulate him.

We are looking to start a book review page. If some of our readers have read some good book on quants related topics, they are welcome to forward a short review of the book for inclusion in our newsletter.

We look forward to hearing from you, solving quant puzzles, posing a few puzzles, and any other interesting activity.

Happy reading.

Regards
Prof N.S.Nilakantan

TEAM QUANTINUUM

MAIN STORY: MEASURE WHAT MESURES

Key Performance Indicators helps in determining ones corporate goals, identifying metrics to grade progress against those goals. Many organizations have adopted a specific approach for establishing KPIs. Effective communication is one way to solve problems related to KPI. A SMART criteria technique can be used. This technique satisfies five criteria: specific, measurable, attainable, relevant and time bound. This is a solid framework for making decisions about KPI selection.

Unfortunately, organizations misinterpret the term relevant and find themselves unsatisfied with the results of this technique. Usually, this is narrowly defined as "relevant to company goals," but what about the individual? If KPIs only become effective when individuals throughout the organization are aware of them and working toward improving them, they will only achieve widespread adoption when the metrics are made relevant to the individual. Without relevancy, organizations are left to bet on communication alone to convince and persuade others into acceptance.

Seven simple strategies can be leveraged to put the relevance back into your KPIs.

- **Identify target audiences**- Selection of KPIs should be meaningful to others and for that it is important to know about their identities. It is especially important to find teams and individuals across the organizations that have the ability to directly impact the health of the business. These are usually not the leaders and strategists, but delivery folks executing on and managing the front lines.
- **Ethnography**- Take a holistic approach to studying your people - observing them in their work environment to better appreciate their needs, motivations, goals, desires, constraints and obstacles. Use research methods such as participant observation and contextual inquiry to gain these insights. If these methods are not feasible, interviews and questionnaires can suffice. Focus your research on answering questions like: Are they driven by financial, intellectual and/or emotional goals? Are they motivated by fear? This information can then be used to establish tangible personas that synthesize these attributes. Personas can serve as powerful communication tools and grounding mechanisms that aid critical business decisions like selecting KPIs.
- **Identify business rhythms**- People and businesses have their schedules and routines. Firstly the key individuals and teams should be identified, then determine the patterns and frequency of their activities. The SMART criteria tell us that good KPIs are also time bound, so select metrics that align with these business rhythms.
- **Perform affinity diagramming**- An important part of selecting KPIs is aligning individual goals and activities with corporate goals and strategy. This sort of gap analysis exercise can be accomplished through affinity diagramming. Affinity diagramming (also known as the KJ method) is an effective technique for efficiently making sense of large quantities of qualitative data and unstructured content and is even more effective when executed as a team.

- **Conduct gap analysis**- This is used to uncover any misalignment between company and personal goals. This will impact effective KPI selection. Another organization technique, mental modeling, builds upon the affinity diagramming strategy and clearly identifies gaps to a visual representation of its inputs. The model illustrates when the individual is focused and/or motivated to affect tasks/metrics that are not consistent with corporate strategy and vice versa. Knowing this information is extremely advantageous, as it gives your organization a blueprint of areas to address from a business process/organization standpoint or to consider and target when selecting KPIs.
- **Consider the domain of control-** Select KPIs that fall within the actionable domain of key personnel. For example, a large retail client once described a series of periodic reports that were packed with pages of metrics to which the store managers were held accountable. This is where knowledge of the work-life details for such individuals is crucial for selecting the right KPIs. KPIs should be easy to calculate, clearly defined and focused in purpose. Selecting KPIs using this criteria increases clarity, focus, determination and motivation in the individual.
- **Compensation alignment**- This is the ultimate strategy to make KPIs relevant for an individual and is simple but effective. Identify metrics that are tied to the compensation (bonus or base) for an individual. If those metrics are not aligned with corporate goals or strategy, assess and adjust the compensation model as necessary. Ultimately, it can be very difficult to consistently motivate individuals to work to improve KPIs when they are not rewarded for doing so. Without such a reward, any benefit from improved KPIs will be perceived as indirect in the eyes of the individual.

Executing these strategies has the beneficial side effect of a personal relationship. Achieve corporate and individual alignment by selecting KPIs that are personally relevant. Engage, understand, empathize and show compassion. Seeking out someone's perspective does wonders for initiative adoption programs, especially at the delivery levels of the organization. Take advantage of that momentum and follow up with these individuals on a recurring basis and strengthen the purpose behind establishing KPIs in the first place.

Diagramming and Modeling

An affinity diagram is created by extracting insights about personas. These insights are written on sticky notes focusing on individual motivations, goals and activities. Then, similar sticky notes are grouped together into a number of physical groups/piles. Finally, the groups are labelled with meaningful one-to-three word phrases. This information is captured electronically, preferably arranged in a spreadsheet file. The super group labels are placed across the top of the spreadsheet in the first row and the group labels are placed in separate columns in the second row under the super group headings. Now transfer the words from the sticky notes to cells under the coordinating group label. Repeat this exercise, but instead create sticky notes that describe the corporate goals, strategy and initiatives. Also, reuse the same group and super-group labels that were just created instead of creating new labels.

To build the mental model, merge the results of the two affinity diagramming scenarios (individual versus corporate) in the spread sheet by copying and pasting the results of the corporate-focused scenario below the results of the individual-focused scenario. Since the labels were reused for the second scenario, the data should align. Now, although the data points align, the values visually indicate where the individual and the company deviate, because each group for each scenario creates a virtual tower of varying height. Analyze the results of the illustration by simply identifying where the tower sizes are relatively and significantly unequal.

MANISHA AGARWAL
EDITORIAL TEAM

IT's ALL ABOUT NUMBERS (...7, 8, 9,.) contd...

SEVEN

World's 7 Most Extreme Airports

Barra Airport, Scotland

Pilots bound for the Scottish isle of Barra must review all the standard reports of weather and air traffic but also keep an eye on a rather unusual factor—the tide chart. This Outer Hebrides airstrip may be the only one in the world where regularly scheduled commercial flights touch down and take off on a beach. One of the three Barra runways—the cockleshell strip known as Traigh Mhor—is underwater, and off-limits, at high tide.

Courchevel Airport, France

At 6,588 feet (2,008 meters) above sea level, this cliffside ski-resort runway in the Alps was perfectly cast in the nail-biting opening sequence of Tomorrow Never Dies. "It's a short runway built into the middle of a mountain," said aviation and travel writer Wilson. "You have mountain weather and snow and wind to consider, and the runway itself is slanted upward like a ramp—there are even ski runs right there by the runway.

Svalbard Airport, Norway

The airport, near Longyearbyen, is the northernmost commercial airport in the world and home to all the typical weather hazards of life above the Arctic Circle.

Matekane Air Strip, Lesotho

Flat space is scarce in the Lesotho, a mountainous monarchy surrounded by South Africa. Consequently, the 7,500-foot-high (2,286-meter-high) runway at Matekane offers the kind of vista usually seen only during flight. Extending just 1,300 feet (396 meters), the airstrip doesn't offer enough room for many pilots to get airborne, so they drive off the cliff, then take flight during the drop.

Paro Airport, Bhutan

The Himalayan peaks that make the approach to the Bhutan's Paro international airport so breathtaking create serious challenges for the few pilots certified to land there.

Saba, Netherlands Antilles

This seaside spit of land on Saba—a tiny Caribbean island administered by the Netherlands—is resort ready but rough as a runway. The airport's landing strip is extremely short. There are cliffs that literally drop into the sea at each end of the runway, so there's no room for error, and there are hills on either side that can create updrafts and downdrafts.

Sea Ice Runway, Antarctica

The sea ice airfield—which sags under planes even in the best conditions—is one of seven extreme airports that could make even your hairiest holiday touchdowns seem cushy by comparison.

EIGHT

Hydration experts are ready to rewrite the popular dictum that people should drink eight glasses of water a day. Magazines, websites, even some medical texts recommend guzzling eight 8-ounce glasses of water a day. The bottled-water business loves it. Hydration experts, however, aren't sure where the "8 x 8" rule came from—or whether it holds water.

Mike Sawka, a U.S. Army research scientist, thinks the origins lie in a 1933 study on rodent hydration. The research led to a recommendation of 2.5 liters a day, or 84.5 ounces of liquid, for a moderately active human to make up for water lost to sweat and excretions. Twenty percent typically comes from foods high in water—soup, ice cream, celery—leaving 67.6 ounces, or roughly "8 x 8." (Exercise or heat adds to a body's needs.)

Only you don't need eight daily glasses of water. Other beverages count, even if caffeinated. Drink if you feel thirsty. If not, don't. One exception: Hydrate before an intense workout.

NINE

By 2045 global population is projected to reach nine billion. Can the planet take the strain?

population biologist Joel Cohen ,in his book How Many People Can the Earth Support?, writes about a cheerful little calculation in the 17th century, which may have been the first attempt to give a quantitative answer to a question that has become far more pressing now than it was then. Most answers these days are far from cheerful.

In 1677, Leeuwenhoek started with an estimate that around a million people lived in Holland. Using maps and a little spherical geometry, he calculated that the inhabited land area of the planet was 13,385 times as large as Holland. It was hard to imagine the whole planet being as densely peopled as Holland, which seemed crowded even then. Thus, Leeuwenhoek concluded triumphantly, there couldn't be more than 13.385 billion people on Earth.

For centuries population pessimists have hurled apocalyptic warnings at the congenital optimists, who believe in their bones that humanity will find ways to cope and even improve its lot.

The debate was present at the creation of population alarmism, in the person of Rev. Thomas Malthus himself. Toward the end of the book in which he formulated the iron law by which unchecked population growth leads to famine, he declared that law a good thing: It gets us off our duffs. It leads us to conquer the world. Man, Malthus wrote, and he must have meant woman too, is "inert, sluggish, and averse from labour, unless compelled by necessity."

Seven billion of us soon, nine billion in 2045. Let's hope that Malthus was right about our ingenuity.

Prof. N.S.NILAKANTAN

QUANTS NEWS DIGEST:

The faster-than-fast Fourier transform

The Fourier transform, which splits a complicated signal into individual pure frequencies, was devised over 200 years ago but only became widely used after the development of an algorithm called the fast Fourier transform in the 1960s. Recently, MIT researchers Dina Katabi, Piotr Indyk and their colleagues have developed an algorithm that is hundreds of times faster. The team discovered they could quickly identify the important frequencies in a sparse signal by combining two existing signal filters to create a new, more efficient one. This filter works by dividing the range of frequencies into sets, then identifying which sets contain important frequencies. The MIT researchers' algorithm, however, "greatly expands the number of circumstances where one can beat the traditional FFT," Strauss says. "Even if that number k is starting to get close to n — to all of them being important — this algorithm still gives some improvement over FFT."

Note: - http://web.mit.edu/newsoffice/2012/faster-fourier-transforms-0118.html

There is no 16-Clue Sudoku: Solving the Sudoku Minimum Number of Clues Problem

An Irish mathematician, Gary McGuire, has used a complex algorithm and 7 millions of hours of supercomputing time to solve an important open problem in the mathematics of Sudoku, the game popularized in Japan that involves filling in a 9X9 grid of squares with the numbers 1–9 according to certain rules. He showed that the minimum number of clues or digits required is 17 to be solvable; puzzles with 16 or fewer clues do not have a unique solution. In his research, McGuire simplified the problem by designing a 'hitting-set algorithm'. Hitting set problems have applications in many areas of science, such as bioinformatics and software testing.

Note: - http://www.nature.com/news/mathematician-claims-breakthrough-in-sudoku-puzzle-1.9751

Pasta Graduates From Alphabet Soup to Advanced Geometry

Mr. Sander Huisman once, while eating pasta, wondered about what mathematical equation would describe the undulating shapes he was eating. Mr Suisman said "I play around with Mathematica a lot". "We were eating pasta, and I was wondering how easy these shapes would be recreated" with the software. After dinner, he figured out the five lines or so of Mathematica computer code that would generate the shape of the pasta and many others.

Note : - http://www.nytimes.com/2012/01/10/science/pasta-inspires-scientists-to-use-their-noodle.html?_r=3&scp=2&sq=pasta&st=cse

VAIBHAV GOEL
EDITORIAL TEAM

New Breed of Math Whizzes Conquered Wall Street

The article chronicles the development and application of financial trading strategies based on mathematical models and other quantitative techniques. Ed thorp commonly known as “Godfather of the Quants” initiated this after reading an article in the Journal of the American Statistical Association that was based on analysis of the probabilities of thousands of blackjack hands.

Based on the analysis, Thorp developed a card counting system to beat the blackjack dealer and presented it to the American Statistical Society in 1961. After testing the system in Reno and Vegas, Thorp published his famous book “Beat the Dealer” in 1962. His method of card counting system was to determine how much to bet on each hand as the odds continually changed.

Thorp also focused on another gambling venue: Wall Street. Thorp's attention was drawn to the problem of pricing stock warrants; no method existed to accurately price them. Thorp realized that his blackjack gambling approach could be applied to warrants. Based on the idea that movements in stock prices were random and described by the bell curve. Thorp and a colleague at the University of California developed a formula to determine if a warrant was mis-priced based on the stock's price volatility. They published their results in Beat the Market: A Scientific Stock Market System, which became the basis of thousands of hedge fund operations in subsequent years. The next quant breakthrough occurred when Fischer Black and Myron Scholes published a method to price stock options which was similar to Thorp’s idea.

Other quantitative techniques developed and employed by quants included the following:

* Factor analysis, in which the joint effects of many variables on a stock's price are combined statistically into "factors," which can be used to predict price movements.
* Momentum strategy, based on the discovery that stocks rose and fell beyond the points that fundamental analysis indicated they should.
* Relative value trading, capitalizing on significant divergences between prices of securities that normally moves in stable patterns.

Because the gains per trade based on small divergences from normal price relationships were very small, most hedge funds using these techniques employed leverage to multiply their volume of transactions and their profits. Leverage ratios of 30 to 1 and higher were not unheard of. Extreme leverage made most hedge funds extremely vulnerable to unexpected events that could disrupt the markets.

VIGNESH SANKARAN
PDGM-A 2011-13

QUANTINUUM ANNUAL DAY 2012

The Quantinuum Annual Day was celebrated on 28th January 2012. Three years ago, Quantinuum was formed as an activity club for interested students to showcase their talents and participate in activities to further hone their quantitative skills.

Quiz Competition

The day started with the campus round of 'Quantiz', a quiz contest. The campus round was preceded by a gruelling online round for which 54 teams, including teams from IIFT, NMIMS, IIT Bombay, SIBM Pune, SIBM Bangalore and SIMSR, participated. The online round resulted in elimination of 38 teams and 16 teams proceeded to the campus round. The campus round consisted of 3 rounds of analytical decision making and quizzing. The final battle was among three SIMSR teams and the team from SIBM Bangalore.

SIMSR team (0 & 1) won Rs.6000 and the second prize of Rs. 4000 was shared between SIBM bengaluru and another team from SIMSR. Certificates and prizes were distributed to the team by Mr. Swaminathan.V., the Executive Vice President of Kotak Mahindra Bank, sponsors for the event. Mr. Swaminathan.V also spoke about Kotak Mahindra Bank and its fundamental strengths flowing from its roots as an NBFC.

Guest Lecture

This was followed by a guest talk by Mr.Rasesh Shah, Vice President of Fractal Analytics, who spoke on the topic of 'Analytics and Application in Business'. He shared his vast knowledge and gave some live examples on analytics. Mr. Rasesh Shah also released the special issue of Quantinuum Newsletter, on Analytics, put out by the editorial team.

Annual report

Team Quantinuum presented its annual report for the year 2011, giving details of the activities undertaken and progress made during the year.

Analytics Workshop

In the evening, a workshop was conducted by Mr.Praneet Aneja and Ms. Pragya Gaur from Fractal Analytics. The workshop was attended by 25 participants for whom it was a great learning on how one can put their analytical skills in practical use. Participation certificates were also issued to the attendees at the end of the session.

MANISHA AGARWAL
EDITORIAL TEAM

ANALYTICS ARTICLE-MBASKOOL

Analytics is a science of analysis. Practically, it is a process of developing optimal or realistic decision recommendations based on insights derived through the application of statistical models and analysis against existing and simulated future data that drives business decisions and actions.

"Analytics is defined as the extensive use of data, statistical and quantitative analysis, explanatory and predictive modeling and fact-based management to drive decision making"- Thomas Davenport

Analytics is an application to solve business and industry problems. Past experiences and rule of thumb concepts can be added to the data to create a qualitative aspect of decision making. However, without adequate data sources selected from various factors of real information, the determination cannot be said to be made with the concept of analytics. Analytics is all about people, to make better decision and achieve results and for this analytics help to accomplish it with full potential.
Analytics relates to statistical analysis and data mining but it is based on modeling to take extensive computation into account. Analytics is used in corporate finance, economic consulting, forensic and litigation consulting, brand management and strategic communications, to track existing inventories and predict and prevent future inventory problems.

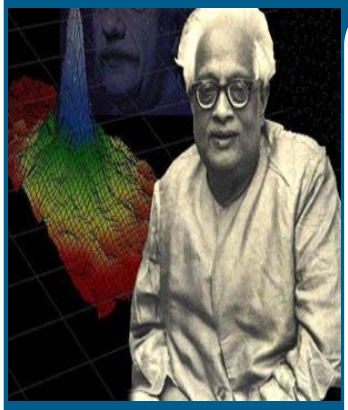
Why use of analytics is good:-

- Finding the best customers, and charging them the right price
- Minimizing inventory in supply chains
- Allocating costs accurately and understanding how financial performance is driven.

As many companies offer similar products use comparable technology, high-performance business processes, so analytics, now-a-days, is considered as a differentiator in order to be a successful company. In addition, the increasingly complex environment in which businesses operate, stringent governance, globalization and cross border trade, increasing competition, choice of business models, reducing time to market and choosy customers – right product, right price, etc.. encourage every company to be more analytical in future. A single analytical initiative results in savings or revenue increases by hundreds of millions or billions for a large organization. The results of analytics can also be measured in overall revenues and profits, market share and customer loyalty.

SAYAK GUPTA
PGDM-A 2011-13

Note: - This is the summary of the article to be published in MBASKOOL.



1st January 1894-
4th February 1974

QUANT GURU of the MONTH

Satyendra Nath Bose: Famous for "Bose-Einstein Theory". A subatomic particle Boson has been named after him. He was honored with "Padma Vibhushan".

History: Satyendra Nath Bose passed the ISc in 1911 from the Presidency College, Calcutta securing the first position. He was an Indian mathematician and physicist. At 22, Bose was appointed lecturer in Calcutta University. In 1921, he joined the then newly created Dacca University as Reader in Physics. He had a couple of papers published by the same journal earlier. It was here while teaching that he wrote this paper for deriving the Planck's Law. His paper was titled 'Planck's Law and Light Quantum Hypothesis.' He was noted for his collaboration with Albert Einstein in developing a theory regarding the gas like qualities of electromagnetic radiation.

Achievements: He is best known for his work on quantum mechanics in the early 1920s, providing the foundation for Bose–Einstein statistics and the theory of the Bose–Einstein condensate. He is honored as the namesake of the boson. He was awarded India's second highest civilian award, the Padma Vibhushan in 1954 by the Government of India.
Although more than one Nobel Prize was awarded for research related to the concepts of the boson, Bose–Einstein statistics and Bose–Einstein condensate—the latest being the 2001 Nobel Prize in Physics, which was given for advancing the theory of Bose–Einstein condensates.

Later work: Bose's ideas were afterwards well received in the world of physics, and he was granted leave from the University of Dhaka to travel to Europe in 1924. He spent a year in France and worked with Marie Curie, and met several other well-known scientists. He then spent another year abroad, working with Einstein in Berlin. Upon his return to Dhaka, he was made a professor in 1926. He did not have a doctorate, and so ordinarily he would not be qualified for the post, but Einstein recommended him. His work ranged from X-ray crystallography to unified field theories. He also published an equation of state for real gases with Megh Nad Saha.

In 1944 Bose was elected General President of the Indian Science Congress. In 1958 he became a Fellow of the Royal Society. In 1986 S.N. Bose National Centre for Basic Sciences was established by an act of Parliament, Govt. of India in Salt Lake, Calcutta in honor of this world renowned Indian scientist.

HARSHITA SRIVASTAV
EDITORIAL TEAM

QUANT TRIVIA

"74 is the number of different non-Hamiltonian polyhedra with a minimum number of vertices."

QUANTS IN LIGHTER VEIN

The Answer from the Ashes Magic Trick

Choose a group like a family gathering, an informal teacher conference, a math class, or even a party.
Preparation: Ten minutes before you begin the trick, excuse yourself and go to the bathroom. There take a bar of soap in hand and with the corner of the moistened end, carefully draw the number 1089 on top of your left forearm. Let it air dry.

Ask for someone from the group who believes he/she have ESP ability and can do addition and subtraction correctly.

Step 1) Tell them to choose any three digit number where the first and last digits differ by two or more. Write it down on the first piece of paper. Numbers like 187, 249, and 386 are fine, but number like 172, 584, and 928 are not.

Step 2) Tell them to reverse the digits and subtract the smaller number from the larger. For instance, if they initially chose 672 as their number, they would be subtracting 276 from the 672 to get 396.

Step 3) Then tell them to reverse the digits of the difference they found and now add them together. In our example, you would add 693 to the 396.

Step 4) Tell them to double check their work and to show everyone the final result as you turn your back. Then tell them to write the final result nice and big on the second piece of paper.

Step 5) Tell them to fold up both pieces of paper three or four times so that you could not see what was written on them.

Step 6) Put both pieces of paper in the large ashtray, ignite, and burn completely into ashes.

Step 7) Tell your mark to concentrate intensely on the final result number and tell your audience that you will divine the number directly from the ashes. Pick up some ashes and rub them directly onto your soap-written arm. As you continue to rub the ashes, they will stick to the dried soap and incredibly the answer **1089** will appear on your arm!!

EDITORIAL TEAM

QUANT TRIVIA

"The most powerful single idea in mathematics is the notion of a variable." – K. Dewdney"

QUANT QUERY OF THE MONTH

Sudoku of the Month

4	6						5	1
	9	3					7	2
	5				8	9		
			9	1				4
		5				7		
9				3	2			
		7	6				9	
1	4					2	8	
5	3						1	7

Answers and name of solvers will be published in the next issue. Mail your answers to simsr.quantinuum@gmail.com

Solution to last month's Sudoku of the month

7	4	3	6	9	2	5	8	1
9	6	2	8	1	5	7	3	4
5	1	8	7	4	3	6	9	2
3	9	7	4	2	8	1	6	5
8	5	1	9	6	7	2	4	3
6	2	4	3	5	1	9	7	8
2	8	6	5	7	4	3	1	9
4	7	5	1	3	9	8	2	6
1	3	9	2	8	6	4	5	7

The correct answer to Sudoku was given by Gaurav Bhargava of PGDM Finance 2009-2011 batch. Congratulations! We invite anyone interested to come forward and solve the Sudoku through Solver.

Quantinuum@SIMSR

Quantinuum, the Quant's forum of KJ Somaiya Institute of Management Studies and Research is formed with two objectives. Firstly to remove the common myth from the students mind that mathematics is difficult. Secondly to give students an exposure on how to make decisions in real life business problems using quantitative techniques. This helps to bridge the gap between theory and the practical application.

For any further queries and feedback, please contact the following address

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