K. J. Somaiya Institute of Management Studies & Research

FEBRUARY 2012 *Volume 3: Issue 2*

Quantinuum Newsletter

Quantinuum - The Quants Forum

Its all about NUMBERS...

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FEBRUARY 2012 VOLUME 3:ISSUE 2

From the Mentor's Desk...

Hi All,
WE hope the newsletter being dished out every month is interesting. We request one and all to take some time off from their busy schedule and unwind with our newsletter.

During February, we marked our presence in the institute events by participating in Melange 2012 and ICON 2012. The Poet competition in Melange had a huge draw of 95 registrations, 29 participants, and six finalists. Teams from all over the country had participated and all the teams performed well. The event in Icon 2012 was targeted towards computer enthusiasts and had a special quiz designed by Mr. Suket Gupta and this also saw sufficient participation from walk-in registrations. We wish to build on this success in the years to come. The event

To make the newsletter more interesting we have added some new features from this month.

We have been able to develop sufficient interest and initiative in the area of quiz and our quiz team is ready to unleash their quiz talent every month and their first monthly quiz is debuting in this issue. Please give them a big hand by solving the quiz.

This issue also features a book review. Essentially we wish to review a quants based book, not a textbook, of course, every month. Readers can also write in with their reviews of any good book in this area.

We welcome suggestions for further improvement.
Happy reading.

Regards
Prof N.S.Nilakantan

TEAM QUANTINUUM

MAIN STORY: How to Validate Data Model

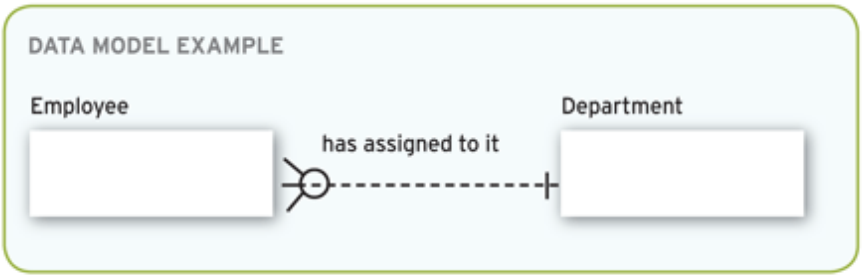
The business data model, also known as the enterprise data model, conceptual data model or logical data model, describes the major information of interest from a business perspective. This model is rarely created as a single project - it is typically built incrementally as needed to support new data structures. It is the unifying model, and all of the subsequently developed data models must be consistent with this one.

Validation Criteria

The business data model is independent of specific application system needs and is best developed by the data management group with input from business subject matter experts. Validation activities for this model include:

- **Completeness for use**: Is all of the data needed to support the pertinent application development project modeled?
- **Completeness**: Are the business areas and concepts represented by the model completely addressed?
- **Accuracy**: Does the model correctly represent the entities, attributes and business relationships of interest? Are the optionalities and cardinalities correct?
- **Standards conformance**: Does the model and the supporting metadata store follow the prescribed policies and practices?
- **Generalization and specialization**: Does the model represent the data at the appropriate level of abstraction?
- **Structure**: Does the model follow the data modeling rules for the level of normalization (typically third normal form) used?
- With the exception of validating aspects of standards conformance and structure, all of these questions require comparing the business needs and environment to the way they are described within the data model. Structure and standards compliance validation should be performed by representatives from the data management group who are experienced data modelers. The remaining validation, however, must clearly be performed by business representatives - but which ones and how?
- The data model addresses several subject areas and crosses organizational boundaries. If a data stewardship council exists, it is very likely that subject area responsibilities have already been assigned and that its members are capable of performing the model validation. In the absence of a data stewardship council, the model must be segmented based on organizational responsibilities, with one or more representatives being responsible for each set of data.
- Model validation by the business community can be performed in several ways. From the modeler's perspective, the most straightforward approach is to print a copy of the diagram and walk through it with the business representatives. This approach requires the businessperson to understand a diagram that is IT oriented, and it is appropriate when the validation is performed by the data stewardship council or people directly involved in IT projects.

- To some businesspeople, the entity relationship diagram is like a foreign language. These people are likely to resist learning how to read the diagram, and a different approach for validating the model is needed. For these people, the best approach is for the data modeler to identify the portions of the model for each person to validate and to verbally interpret the information in the model and the associated business rules. For instance, if the model contains the entities and relationships in the example (see figure), the businessperson should be asked to confirm that a person is always assigned to a specific department, but that some departments may have no employees within them.



Further, since the metadata includes definitions, the definitions for "department" and "employee" should be confirmed. Additionally, the data elements included within each of the two entities should be listed, and the businessperson should be asked whether or not any significant ones have been omitted.

The business data model describes the business. While the representation of the data can be validated by representatives from data management, the content should be validated by businesspeople. The review process itself should be tailored to the reviewer and alternatives to an examination of the actual diagram may be needed if the reviewer is not familiar with the notations.

For further references: - http://www.information-management.com/issues/21_2/data_model_quality_business_intelligence_ROI-10019884-1.html

SATYADEV KALRA
EDITORIAL TEAM

IT's ALL ABOUT NUMBERS (...10, 11, 12) contd...

TEN

Number Ten is the start of a whole new order of numbers and the culmination of the numbers that come before it. This may seem to be merely a distinction given to ten under our decimal numbering system. However the numbering systems in use in the time that the Bible was written were also based upon the number ten. A look at the number values assigned to the Hebrew and Greek letters will show that the letters were given values from one to ten, then increasing in tens to 100 then increasing by 100's and so on. Furthermore numbering by tens is built in to our very anatomy, count up on your fingers and when they are all used, make a mark on a piece of paper and start from your first finger again. Soon you will have a number of marks, each representing 'two hands' worth. Thus in ancient times as in modern times ten is the start of a whole new order of numbers and the culmination of the numbers that come before it.

Thus wherever ten is found this completeness of order is also seen. Ten implies completeness of order, nothing lacking and nothing over. It signifies that the cycle is complete and that everything is in its proper order. Thus ten represents the perfection of divine order.

Ten is also the first of the triangular numbers which has a center.

ELEVEN

Eleven is a programming language for creating reliable, scalable web applications. Applications are expressed in a high-level language with a simple, C-like syntax, from which the Eleven compiler generates complete, ready-to-run implementations in PHP or mod_perl.

Eleven is designed for applications in which rapid development, high performance, and stability are critical - but total control over the look and feel is not (since Eleven generates most of the user interface automatically). Good examples are online exams and surveys, electronic voting, and business workflow applications.

Eleven automates the work of making web applications statesafe, substantially reducing development time and effort over trying to achieve similar goals with traditional web programming languages like PHP and JSP.

In a nutshell, the idea behind Eleven is: *Address the problems of application reliability and scalability by reducing them to the more easily solved problem of optimizing database performance*.

The Eleven compiler is distributed under the terms of the General Public License.

IT's ALL ABOUT NUMBERS (...10, 11, 12) contd...

TWELVE

The long standing challenge was that a single piece of paper, no matter the size, cannot be folded in half more than 7 or 8 times. Assuming it were possible to fold paper without restriction, the height of a piece of folded paper would double in thickness each time it was folded. Since one sheet of typical 20-pound paper has a thickness of about 0.1 millimeter, folding 50 times (if this were physically possible, which of course it is not) would produce a wad of height meters, and folding one more time would make the stack higher than the distance between the Earth and Sun.

The function

$$L = \frac{1}{6}\pi d\,(2^n + 4)(2^n - 1),$$

gives the loss function for folding paper in half, where ***L*** is the minimum possible length of the material, *d* is the thickness, and *n* is the possible number of folds in a given direction. This formula indicates how much "normalized" paper has been lost for n folds, and thus sets a limit for the number of times things of finite thickness can be folded in one direction (Pomona Valley Historical Society). For n = 0, 1, 2 ... the sequence $L/(\pi d)$ gives 0, 1, 4, 14, 50, 186, 714 ... (Sloane's A076024). The formula was derived by high school student Britney Gallivan in December of 2001.

PROF. N.S.NILAKANTAN

QUANTS NEWS DIGEST

Seven equations that rule our world

This article by Ian Stewart, in the New Scientist, discusses several equations that revolutionized scientific understanding and that today govern all kinds of phenomena with which we interact on a daily basis. The Author puts the spotlight on 7 equations: the Wave equation, Maxwell's four equations, the Fourier transform, and Schrödinger's equation.

By the time one wakes up, by that time at least six mathematical equations have already influenced his/her life. The memory chip that stores the time in a clock couldn't have been devised without a key equation in quantum mechanics. Its time was set by a radio signal that we would never have dreamed of inventing were it not for James Clerk Maxwell's four equations of electromagnetism. And the signal itself travels according to what is known as the wave equation. The article highlights about the importance of each equation in one way or other helping to invent a new technology.

Fourier transform

$$\hat{f}(\xi) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \xi} dx$$

Maxwell's equations

$$\nabla \cdot \mathrm{E} = 0 \qquad \nabla \times \mathrm{E} = -\frac{1}{c}\frac{\partial H}{\partial t}$$

$$\nabla \cdot \mathrm{H} = 0 \qquad \nabla \times \mathrm{H} = \frac{1}{c}\frac{\partial \mathrm{E}}{\partial t}$$

Wave equation

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

Schrödinger's equation

$$i\hbar \frac{\partial}{\partial t}\Psi = \hat{H}\Psi$$

Ian Stewart is a mathematician at the University of Warwick, UK. His latest book, In Pursuit of the Unknown: 17 Equations That Changed the World, is published by Basic Books/Profile.

Note:- For more details, please refer http://www.newscientist.com/article/mg21328516.600-seven-equations-that-rule-your-world.html?full=true&print=true

An Israeli professor's 'Eureqa' moment

An Israeli Professor Hod Lipson made a computer program which can be used to generate formulas to accurately describe natural phenomena. The program named Eureqa is based on the concept of "evolution" algorithms and works off of large data sets from observations of systems. It randomly modifies the equations in a series of "generations" while filtering out the equations on continuous basis that best fit the data and discarding the rest.

Hod Lipson is an American robotics engineer. He is the director of Cornell University's Creative Machines Lab (CCML). Lipson has been involved with machine learning and presented his "self-aware" robot at the 2007 TED conference

Note:- For more details, please refer http://www.haaretz.com/weekend/magazine/an-israeli-professor-s-eureqa-moment-1.410881

QUANTS NEWS DIGEST contd....

Finally, the Physics of the Ponytail Explained

It has been found that the shape of a ponytail can be deduced from the properties of a single hair. Few scientists says that a general continuum theory for the distribution of hairs in a bundle is developed by considering individual fibers as elastic filaments with random intrinsic curvatures which highlights the Physics behind ponytail. Mathematics tells us how individual hairs behave when they're twisted and bent through conduits. Three factors of the hairs are elasticity, density and curliness. Unilever, a major producer of hair care products, got some mathematicians to come up with a mathematical formula to understand how to make more attractive ponytails. So this is actually much more than a question about hairstyle.

Note: - For more details, please refer http://www.npr.org/2012/02/18/147090057/finally-the-physics-of-the-ponytail-explained

You can't do the math without the words

A recent study shows that a few tongues lack number words and as a result, people in these cultures have a difficult time performing common quantitative tasks. This study was done by University of Miami anthropological linguist on Amazonian tribe.

It gives rise to a question of- "what tools like number words really allows us to do and how they change the way we think about the world."

This finding supports the idea that language is a key component in processes of the mind. Preservation of mother tongues is important because languages can tell us about aspects of human history, human cognition, and human culture that we would not have access to if the languages are gone.

Note: - For more details, please refer http://www.eurekalert.org/pub_releases/2012-02/uom-ycd022012.php

VAIBHAV GOEL
EDITORIAL TEAM

BOOK REVIEW: THINKING, FAST AND SLOW

Kahneman, D. (2011). Thinking Fast and Slow, Allen Lane 2011

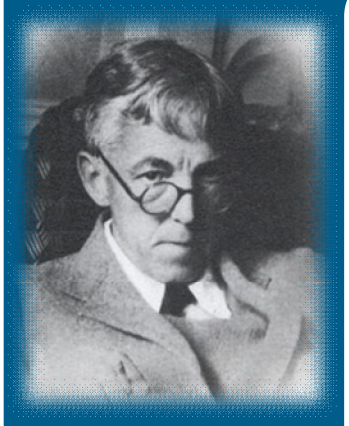
Daniel Kahneman is one of the world's most important thinkers. He received the Nobel Prize in Economic Sciences in 2002, for his seminal work in psychology, challenging the rational model of judgment and decision making. His ideas have had a profound impact in many fields-including business, medicine, and politics. This book brings together his many years of research.

In Thinking, Fast and Slow, Kahneman takes us on a groundbreaking tour of the mind and explains the two systems that drive the way we think and make choices. One system is fast, intuitive, and emotional; the other is slower, more deliberative, and more logical. Kahneman exposes the extraordinary capabilities-and also the faults and biases-of fast thinking, and reveals the pervasive influence of intuitive impressions on our thoughts and behaviour. The importance of properly framing risks, the effects of cognitive biases on how we view others, the dangers of prediction, the right ways to develop skills, the pros and cons of fear and optimism, the difference between our experience and memory of events, the real components of happiness-each of these can be understood only by knowing how the two systems work together to shape our judgments and decisions.

Drawing on a lifetime's experimental experience, Kahneman reveals where we can and cannot trust our intuitions and how we can tap into the benefits of slow thinking. He offers practical and enlightening insights into how choices are made in both our professional and our personal lives-and how we can use different techniques to guard against the mental glitches that often get us into trouble. Thinking, Fast and Slow will transform the way you take decisions and experience the world.

Daniel Kahneman is a Senior Scholar at Princeton University, and Emeritus Professor of Public Affairs, Woodrow Wilson School of Public and International Affairs.

Review by Prof. N.S.Nilakantan



7th February 1877-
1st December 1947

QUANT GURU of the MONTH

Godfrey Harold "G. H." Hardy (7 February 1877 – 1 December 1947) was a prominent English mathematician, known for his achievements in number theory and mathematical analysis.

Starting in 1914, he was the mentor of the Indian mathematician Srinivasa Ramanujan. Hardy almost immediately recognized Ramanujan's extraordinary albeit untutored brilliance, and Hardy and Ramanujan became close collaborators.

He is usually known by those outside the field of mathematics for his essay from 1940 on the aesthetics of mathematics, *A Mathematician's Apology*, which is often considered one of the best insights into the mind of a working mathematician written for the layman.

Early years: G.H. Hardy was born in Cranleigh, Surrey, England, into a teaching family. Hardy's own natural affinity for mathematics was perceptible at a young age. When just two years old, he wrote numbers up to millions, and when taken to church he amused himself by factorizing the numbers of the hymns.

Work: Hardy was a pure mathematician who hoped his mathematics could never be applied. However in 1908, near the beginning of his career, he gave a law describing how the proportions of dominant and recessive genetic traits would be propagated in a large population. Hardy considered it unimportant but it has proved of major importance in blood group distribution.

Hardy was only one to recognize Ramanujan's genius, and brought him to Cambridge University, and was his friend and mentor for many years. The two collaborated on many mathematical problems, although the Riemann Hypothesis continued to defy even their joint efforts.

1,729 is the smallest number which can be represented in two different ways as the sum of two cubes:

$$1729 = 1^3 + 12^3 = 9^3 + 10^3$$

It is also incidentally the product of 3 prime numbers:

$$1729 = 7 \times 13 \times 19$$

The largest known similar number is:

$$885623890831 = 7511^3 + 7730^3 = 8759^3 + 5978^3 = 3943 \times 14737 \times 15241$$

A common anecdote about Ramanujan during this time relates how Hardy arrived at Ramanujan's house in a cab numbered 1729, a number he claimed to be totally uninteresting. Ramanujan is said to have stated on the spot that, on the contrary, it was actually a very interesting number mathematically, being the smallest number representable in two different ways as a sum of two cubes. Such numbers are now sometimes referred to as "taxicab numbers".

HARSHITA SRIVASTAV
EDITORIAL TEAM

QUANT TRIVIA

"87 is the sum of the squares of the first 4 primes."

QUANTS IN LIGHTER VEIN

Covent Garden Problem

Mrs. Smith and Mrs. Jones are two ladies and they have equal number of apples but Mrs. Jones have larger fruits and is selling hers at the rate of two for a dollar, while Mrs. Smith sells three of hers for a dollar.

Mrs. Smith had to leave and asked Mrs. Jones to dispose of her stock. Upon accepting the responsibility of disposing her friend's stock, Mrs. Jones mixed them together and sold them of at the rate of five apples for two pence.

When Mrs. Smith returned the next day the apples were sold, but when they came to divide the earnings they found that they were just seven dollars short, and it is this shortage in the apple or financial market which has disturbed the mathematical equilibrium for such a long period.

If they divide the money equally, each taking one-half, how much money Mrs. Jones lost by this unfortunate partnership?

EDITORIAL TEAM

QUANTS QUIZ OF THE MONTH

Q1. You must cut a birthday cake into exactly eight pieces, but you're only allowed to make three straight cuts, and you can't move pieces of the cake as you cut. How can you do it?

Q2. A contractor had employed 100 labourers for a flyover construction task. He did not allow any woman to work without her husband. Also, atleast half the men working came with their wives. He paid five rupees per day to each man, four rupees to each woman and one rupee to each child. He gave out 200 rupees every evening. How many men, women and children were working with the contractor?

Q3. There is a safe with a 5 digit number as the key. The 4th digit is 4 greater than the second digit, while the 3rd digit is 3 less than the 2nd digit. The 1st digit is thrice the last digit. There are 3 pairs whose sum is 11. Find the number.

Q4. A person travels on a cycle from home to church on a straight road with wind against him. He took 4 hours to reach there. On the way back to the home, he took 3 hours to reach as wind was in the same direction.
If there is no wind, how much time does he take to travel from home to church?

Q5. Substitute digits for the letters to make the following relation true.

```
    STILL
+WITHIN
--------------------
 LIMITS
```

Please send us the answers at simsr.quantinuum@gmail.com. Answers and Name of the winner (first all-correct/most correct entry) will be published in the next issue.

QUANTIZ TEAM

QUANT TRIVIA

"Mathematics is the supreme judge; from its decisions there is no appeal.

~

Tobias Dantzig"

QUANT FUN

Sudoku of the Month

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

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

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

Quantconnect

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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For more details: http://quantinuum.weebly.com/

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