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## Up is Up; Why Expert Knowledge Should be Favored in a Technology Driven World

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# Agenda

- Introduction
- Subject Matter Experts
- The Role of Subject Matter Experts
- Data and Expertise Meeting in the Middle
  - Trusting your Data
  - Trusting your Experts
- The Power of Technology Supported by Subject Matter Expertise
- Wrap Up





# Introduction

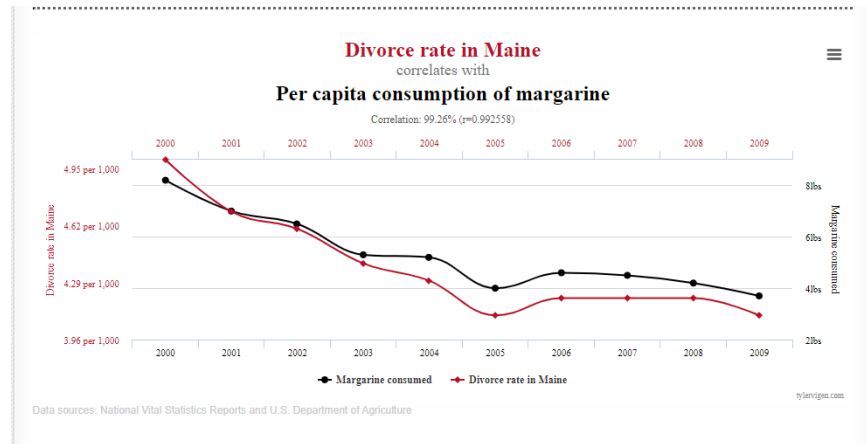
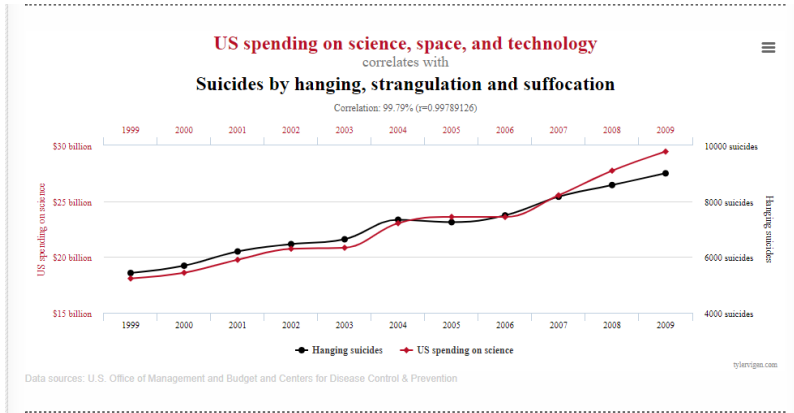
- In 2020, every person generated ....
  - 1.7 megabytes of data per second
    - Facebook generates 10 terabytes
    - Twitter generates 7 terabytes of data every day
    - Some enterprises generate terabytes of data every hour of every day of the year
  - Every day has 86,400 seconds
  - 1 Terabyte of data is generated per week per person
- In the age of big data, we are often tempted to put aside expert knowledge in favor of what all this data tells us
- Tons of data, with out well reasoned analysis by humans with subject matter expertise, can lead to bad decisions
- Subject matter expertise should continue to be an important tool in decision makers tool chest





# Introduction

- Often an expert is required to help interpret your data



# Subject Matter Experts



- A Subject Matter Expert(SME) is an authority in a particular technology, process, function, machine, etc.
- They are the Jedis who have been in their roles for long and intensive periods whose skills and knowledge are second nature
- The perfect SME has three essential qualities
  - The most knowledgeable and articulate person about a specific topic or technology
  - The time and availability to share this knowledge with the people who need it
  - Willing and excited about being part of the training design process
- Subject Matter Experts can play a starring role in the success of a project – filling knowledge gaps that take a team from good to great!



# The Role of Subject Matter Experts

- The SME is responsible to ensure that projects/programs meet the needs of the stakeholders, legislation, policies, standards and best practices.
- How the SME achieves this goal....
  - Support the definition of processes and policies
  - Accurately communicate the business unit's needs to the project team
  - Validate the requirements and deliverables of the product(s) and/or service(s) to be delivered
  - Communicate between the project team and the consumer of the product(s) and/or service(s) to be delivered



# The Role of Subject Matter Experts

- How the SME achieves this goal....
  - Provide input for the design and construction of test cases and scenarios
  - Support development of training material and other product documentation
  - Test the product(s) and/or service(s) as part of user acceptance testing
  - Provide guidance to team members to ensure accuracy of content
  - Provide expertise to resolve issues relevant to project deliverables
  - Manage change process for rules, processes and policies as necessary
  - Be committed to the project and participate proactively in project workshops





# The Meaning of Your Data

- The path from data to information is fraught with complications
- Every metric is subject to interpretation
  - “What does this number mean?”
  - “What does it measure?”
  - “How was it measured?”
  - “What were the sources of this metric?”
- Technology and technological advances help us collect and analyze data
- Subject Matter expertise plays a crucial role in understanding the meaning of the data collected







# Trusting Your Data



## ■ The Big Data Conundrum:

- Today's businesses have access to almost unlimited amounts of data
- If we can sense it – we can store it
- Processing
- All this raw data comes in various formats
- Processing all this disparate data is impractical (or possibly impossible)

## ■ What is Big Data

- In 2020 an IBM survey found that more than half of business leaders lack the insights necessary to do their jobs despite generating data like never before in history.
- So much data is being collected but, not surprisingly, the percentage of data getting processed is decreasing
- SMEs are an important part of the process making sure the right data gets processed



# Trusting your Data

## ■ Characteristics of Big Data

### – Volume

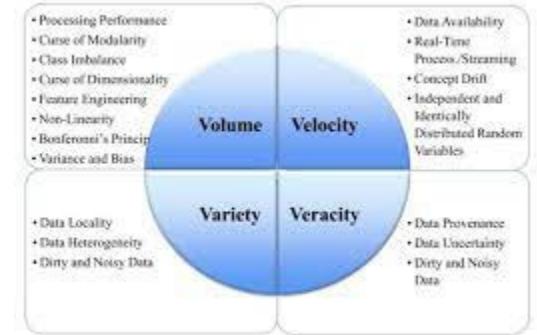
- Volume of data being stored is exploding
  - In 2000 there were 800,000 petabytes (million gigabytes) in the world
  - Statista market survey projects 180 zetabytes (trillion gigabytes) worldwide by 2025
- Blind zone created as the amount of data collected rises

### – Variety

- Enterprise wide data is complex because it includes
  - Traditional relational data
  - Raw, Semi-structured and unstructured data from e-mail, social media, sensor data, web pages, etc.
- The problem is most traditional analysis platforms do not handle variety

### – Velocity

- The speed at which the data is flowing is often more than a traditional system can handle
- Often the shelf life of data is short lived and needs to be analyzed in near real time





# Trusting your Data

## ■ Data Veracity

- Accuracy and truthfulness of the data and the analytics produced from the data
- Introduction of errors during data generation, collection and analysis affects these qualities

## ■ Ensuring Data Veracity

- In Harvard Business Review in 2013, Kate Crawford discussed data veracity in an article entitled “The Hidden Bias of Big Data”
- She disputes the notion that “if you have enough data, the numbers speak for themselves”
- The basis of this dispute was:
- It also should be noted that humans also introduce bias, both intentional and unintentional, during collection and analysis that may weaken the veracity of the data

# Trusting your Experts

- According to an article “What is a Subject Matter Expert” (thebalanecareers.com 2020)
  - A Subject Matter Expert is an individual with a deep understanding of a “particular job, process, department, function, technology machines, material or type of equipment.” In fact, an SME is most likely proficient in several of these areas.
  - After years developing extensive knowledge – SMEs are the people a business turns to when general knowledge is insufficient
  - SME’s should be considered excellent sources to help organizations address the Big Data Conundrum
    - They can complement data analysis with the common sense that comes from truly understanding the subject of analysis
    - They can, where appropriate, dispel the notion that correlation always indicates causation





# Trusting your Experts

- The problem with SME's is that they are human, and as such, tend to introduce bias into the judgements. In his book, *"How to Measure Anything"*, Douglas Hubbard notes:
  - *"It's no revelation that the human mind is not a purely rational calculating machine. It is a complex system that seems to comprehend and adapt to its environment with an array of simplifying rules. Nearly all of these rules prefer simplicity over rationality. Those that are not quite rational but perhaps not a bad rule of thumb are called heuristics. Those that fly in the face of reason are called fallacies."*
- The conundrum for the cost estimating community is that because our data sets are often small, noisy or non-existent – sometimes we need to complement with or rely entirely on expert judgement.
- Subjectivity is an issue that surrounds the compilation of all estimates, and the use of expert judgement is unavoidable regardless of the model used, though in general the expert making a 'subjective' judgement apply careful reasoning, experience and observations. From Joe Hamaker's paper *"What are Quality Cost estimates or the 260Hz Cost Estimate"*
  - *"But my point is that many of us close to the practice do have some innate and intuitive ability, honed by years of being associated with the cost estimating game, that is usually pretty reliable when it comes to judging the quality of a cost estimate"*



# Trusting your Experts

- In his paper, “The Psychology of Estimating”, Andy Prince presents a thorough list of biases and then provides some anecdotes to contain those biases
  - Have a good process
  - Inject a healthy dose of reality by incorporating historical, technical and programmatic data along with cost estimating expertise
  - Validate results
  - Embrace, acknowledge and understand the uncertainty in your estimate
  - Be the cost expert
  - Build and tell your story
- You can apply your own expert judgement by asking the “why?” question. To counterbalance bias is to have a different expert ask the “why not?” question





# Trusting your Experts

- Organizations should define a process to elicit and synthesize Expert Judgement
  - The process should be documented, and SMEs and the consumers of their judgement should be familiar with the process
  - Naturally, the process should be tailorable based on the nature of each elicitation (not every decision requires a full court press)
- Two common methods used for structured elicitation
  - Structured Expert Judgement
    - A structured process through which judgements are provided from cost, technical and/or programmatic experts in a probabilistic format that incorporates their knowledge along with uncertainty in that knowledge
  - Delphi Method
    - An interactive forecasting technique that is executed by a group of experts involving several rounds of questioning, often supplemented with face-to-face interactions, to lead the group to a consensus.

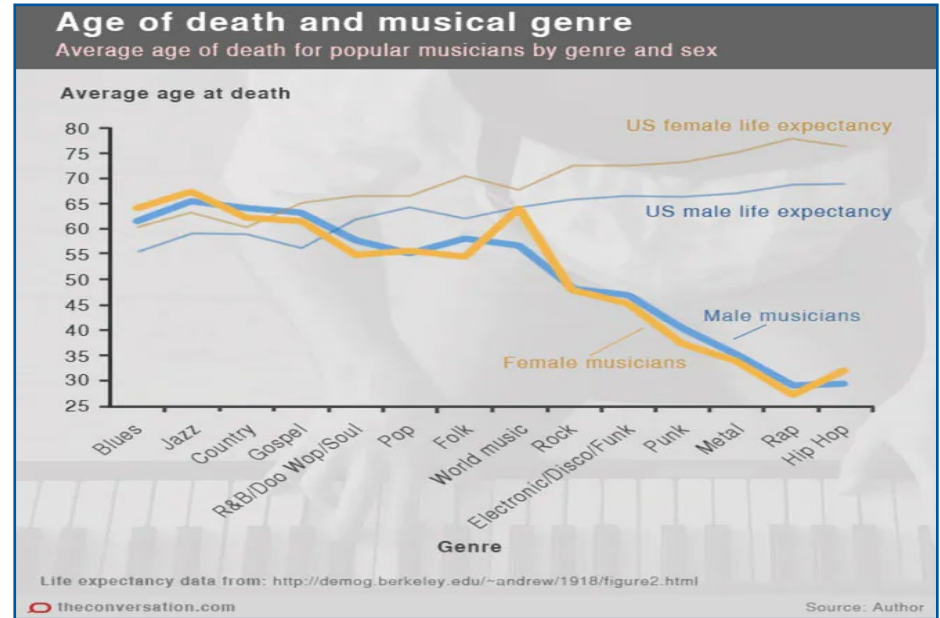
## WHAT IS DELPHI METHOD



# Technology Supported SME Case Study 1

## ■ Age of Death and Musical Genre

- Professor of psychology and music at University of Sydney, Dianna Theadora Kenny
- Examined the deaths of 13,000 pop musicians to look for patterns
- Results from data analysis led Dr. Kenny to report that musicians in traditional music genres (blues, jazz, country) live much longer than do musicians in new genres (metal, rap, hip-hop)







# Technology Supported by SME Case Study 1

## ■ Big Take-away/Lessons Learned

- The average age at death for musicians in relatively new genres does not appear to be dramatically lower for musicians in traditional music genres and for the population
- But the female and male life expectancy lines seem to be showing an increase in life expectancy overtime which makes sense
- The average age at death for rappers and male hip-hop artists is less than 30 though some have survived well into their 40's,50's ,60's or even older

## ■ An SME would look at the data and possibly observe...

- The new genres are so new that the artists haven't had a chance to live to an old age
- Hip-hop began in the late 1960's while blues, jazz and country began much earlier than 1970's - likely making them a much larger part of the data sample



# Technology Supported by SME Case Study 2

## ■ Neural Networks (AI) Trained to detect Tanks

- US Army wanted to install surveillance cameras equipped with advanced deep neural network algorithm that would recognize tanks hiding in trees
- Researchers took 200 photographs of a forest – 100 with tanks, 100 without tanks
- The algorithm was trained with 50 of each type of photo, and tested with the remaining 100 with great success
- Subsequent applications of the algorithm were much less successful, approximating the success of a coin flip
- Further investigation into the experiment identify that all of the tank pictures were taken on cloudy days, while all the tank-less pictures were taken on sunny days

## ■ Big take-away

- SME review would have offered the opportunity to discover the discrepancy between the two sets of photographs
- A better approach would have been to edit copies of the tank pictures to remove the tanks



# Wrap Up

- Technology offers countless opportunities to collect more and more data – almost every activity we engage in generates data.
- More data means more possibilities, but more data is not a panacea...
  - Correlation does not necessary, mean causation
  - Data often does not tell the whole story
  - The increasing amount of data, and the speed with which it is collected, provides challenges to the analysis tools and technologies and with the analysts
- Subject Matter Expertise, while also not a panacea, offers a complement to predictive data analytics, to improve results of analysis
  - Help optimize the decision of which data is best for a particular analysis exercise
  - Apply expertise to analysis results to incorporate knowledge and common sense
  - Fill in gaps where there are small and/or noisy data sets or where there is no data all