

The background of the slide is a deep blue gradient. At the top, there is a horizontal band featuring a detailed image of an iceberg's surface and its reflection in the water below. The iceberg has a jagged, crystalline appearance with various textures and shadows.

EVIDENCE DRIVEN DECISION MAKING – EVOLUTION

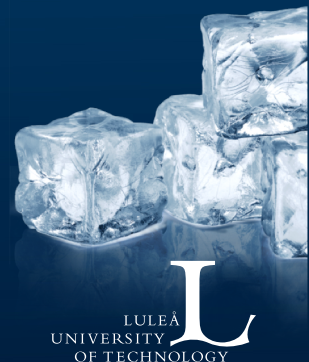
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November 2018

<https://www.bigdataconference.lt/>

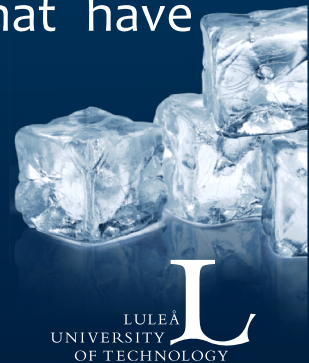
#bigdata2018



The background of the slide features a large iceberg floating in dark blue water. The top of the iceberg is jagged and white, with some snow or ice on its surface. The water is a deep, dark blue, and the overall scene is dimly lit, creating a cold and serious atmosphere.

EXECUTIVE SUMMARY

- In this talk, I will focus on introducing one of the most important skills a manager should have. That is, decision making. The talk will highlight various aspects of decision making including its evolution, steps, and the difficulty surrounding it nowadays in the era of big data. The talk will also focus on the importance of decision making to individuals, businesses, and societies. Examples of historic decisions that have influenced our lives will also be presented.



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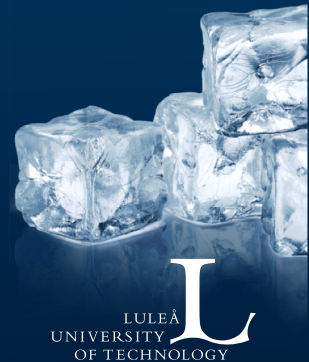
Peter Drucker

*WHENEVER YOU SEE A SUCCESSFUL BUSINESS, SOMEONE ONCE MADE A
COURAGEOUS DECISION*

The background of the slide features a large, jagged iceberg floating in a dark blue body of water. The iceberg's surface is textured with various cracks and ridges, and its reflection is visible in the calm water below. The overall color palette is a range of blues, from deep navy to light, icy whites.

SO WHAT IS DECISION MAKING?

— The process of **choosing** among **alternative** courses of action and choose the option that achieves a certain **goal** or maximizes **utility**.



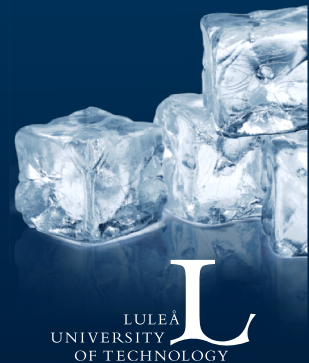
SO, WHY IS IT SO DIFFICULT?



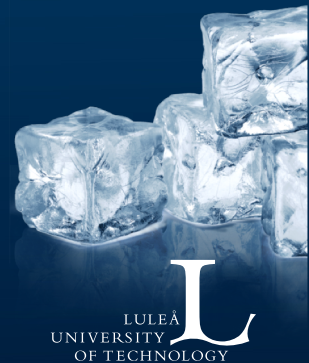


THE DIMENSIONS OF DIFFICULTY

- **Uncertainty:**
 - The state that exists when the decision maker has uncertain information
- **Conflict:**
 - Opposing pressures from different sources such as individuals
- **Scarcity of resources:**
 - Resources are scarce!
- **Lack of Structure:**
 - New problems, no existing reference model to solve it
- **Uncontrollability:**
 - Environmental and other external variable influence



TAXONOMY OF DECISIONS & THE PROCESS



The background of the slide features a large iceberg floating in dark blue water. The iceberg's surface is jagged and textured, with some snow or ice patches. The water reflects the iceberg and the sky. The title 'TYPES OF DECISIONS' is centered in white, bold, sans-serif font.

TYPES OF DECISIONS

— Structured

- Repetitive, routine, much certainty
- Involve definite procedure for handling them so do not have to be treated as new

— Unstructured

- Novel, important, nonroutine, much uncertainty
- No well-understood or agreed-upon procedure for making them

— Semi-structured

- Only part of problem has clear-cut answers provided by accepted procedure



The background of the slide is a dark blue gradient. At the top, there is a horizontal band showing a close-up of icebergs and sea ice, with some icebergs having masts visible. The title 'HERBERT SIMON DECISION MAKING MODEL' is centered in white, bold, sans-serif font.

HERBERT SIMON DECISION MAKING MODEL

1. Intelligence

—Data collection!

2. Design

—Identifying and exploring alternative course of actions

3. Choice

—Choosing the best alternative

4. Implementation

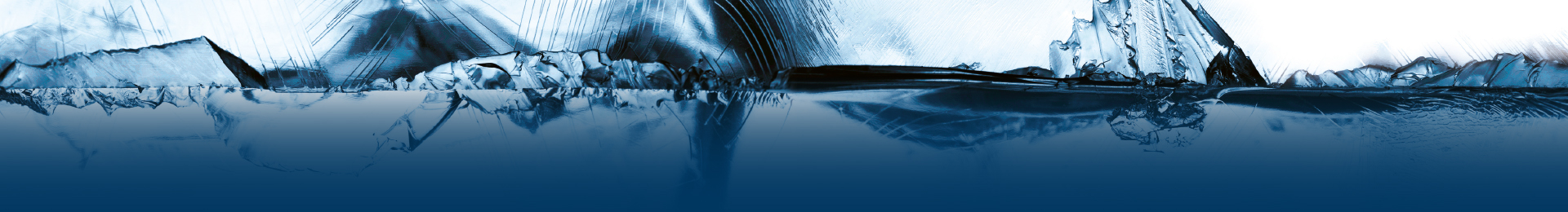
—Put the chosen alternative to work and monitor how well it is working





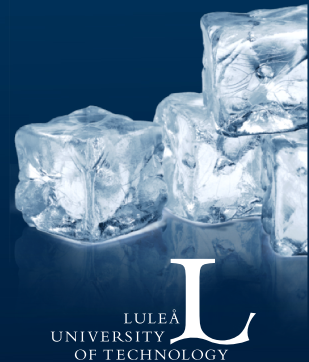
INTELLIGENCE: DATA PROBLEMS

- Incorrectness
- Incompleteness
- Not timely
- Not verifiable
- Incompatibility
- Overload!



Henri Fayol, Henry Mintzberg, Herbert Simon, DSS, GDSS, EDW, Big Data

EVOLUTION



The background of the slide is a deep blue gradient. At the top, there is a horizontal band showing a close-up of icebergs floating in water, with their jagged edges and textures clearly visible. The water reflects the sky and the ice. In the bottom right corner, there is a small cluster of several clear, rectangular ice cubes stacked together.

HENRI FAYOL (1841-1925)

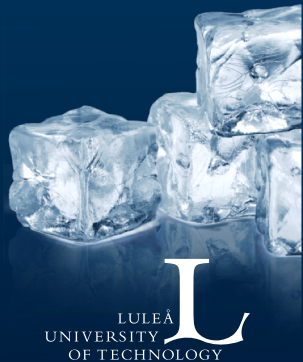
The background of the slide features a large iceberg floating in dark blue water. The iceberg's surface is jagged and textured, with some snow or ice patches. The water reflects the iceberg and the sky. The overall color palette is shades of blue and white.

HENRI FAYOL

— According to Fayol all activities of organizations can be divided into **six groups (functions)**:

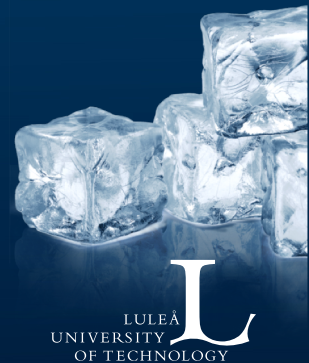
- Technical (production, manufacture, adaptation)
- Commercial (buying, selling, exchange)
- Financial (search for and optimum use of capital)
- Security (protection of property and persons)
- Accounting (stocktaking, balance sheet, costs, statistics)
- **Managerial** (planning, organization, command, coordination, control)

First to identify elements of “Management”



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HENRY MINTZBERG (1939-PRESENT)



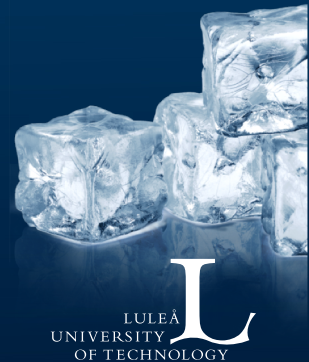


HENRY MINTZBERG

**In Mintzberg model, managers play
10 different roles that fall into 3
categories:**

- **Interpersonal roles**
- **Informational roles**
- **Decisional roles**

- **Interpersonal:**
 - Figurehead
 - Leader
 - Liaison
- **Informational:**
 - Monitor
 - Disseminator
 - Spokesperson
- **Decisional:**
 - Entrepreneur
 - Disturbance handler
 - Resource allocator
 - Negotiator



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HERBERT SIMON (1916–2001)



HERBERT SIMON

- Management = Decision Making
- Simon's *intelligence-design-choice* model of the decision-making process has been widely used in the literature.
- He coined the terms —*bounded rationality* (that decision makers may be rational but are limited in cognitive processing ability when confronted with complex problems) and —*satisficing* (that even if the optimal decision is sought, bounded rationality and limited information may result in accepting a solution that is —good enough)).



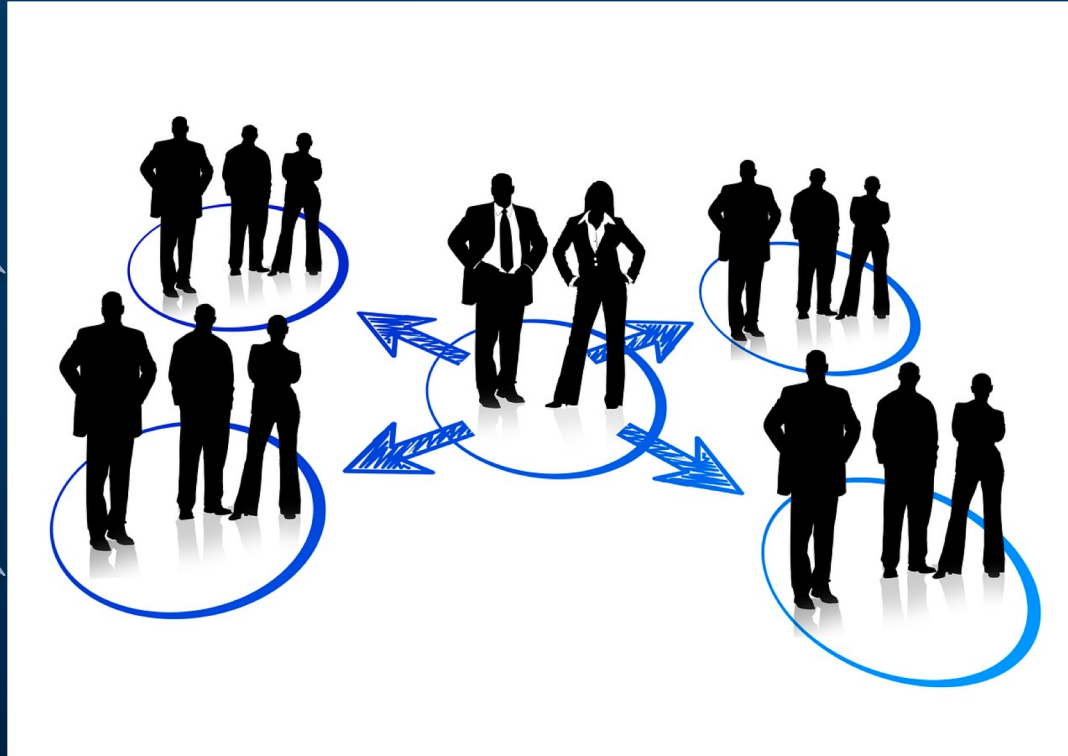
DECISION SUPPORT SYSTEMS (DSS) GORRY & SCOTT-MORTON'S (1971)

- DSS's have been developed to facilitate better decision making for difficult and complex structured, semi-structured, and unstructured decisions.
- Structured decisions:
 - DSS enable users to understand a large number of parameters and relationships that are stable but nevertheless limit the decision maker's ability to process all aspects of the decision.
- Semi-structured & unstructured decisions:
 - DSSs handle a large number of parameters and relationships but also attempt to alleviate the effect of some unknown or shifting parameters and relationships on the decision.

GDSS

Groupware

No need
for same
location



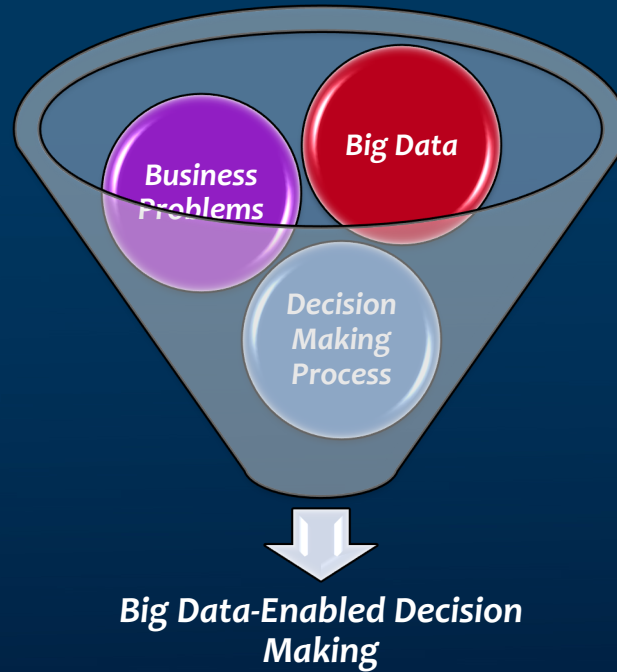
Group
Conflict

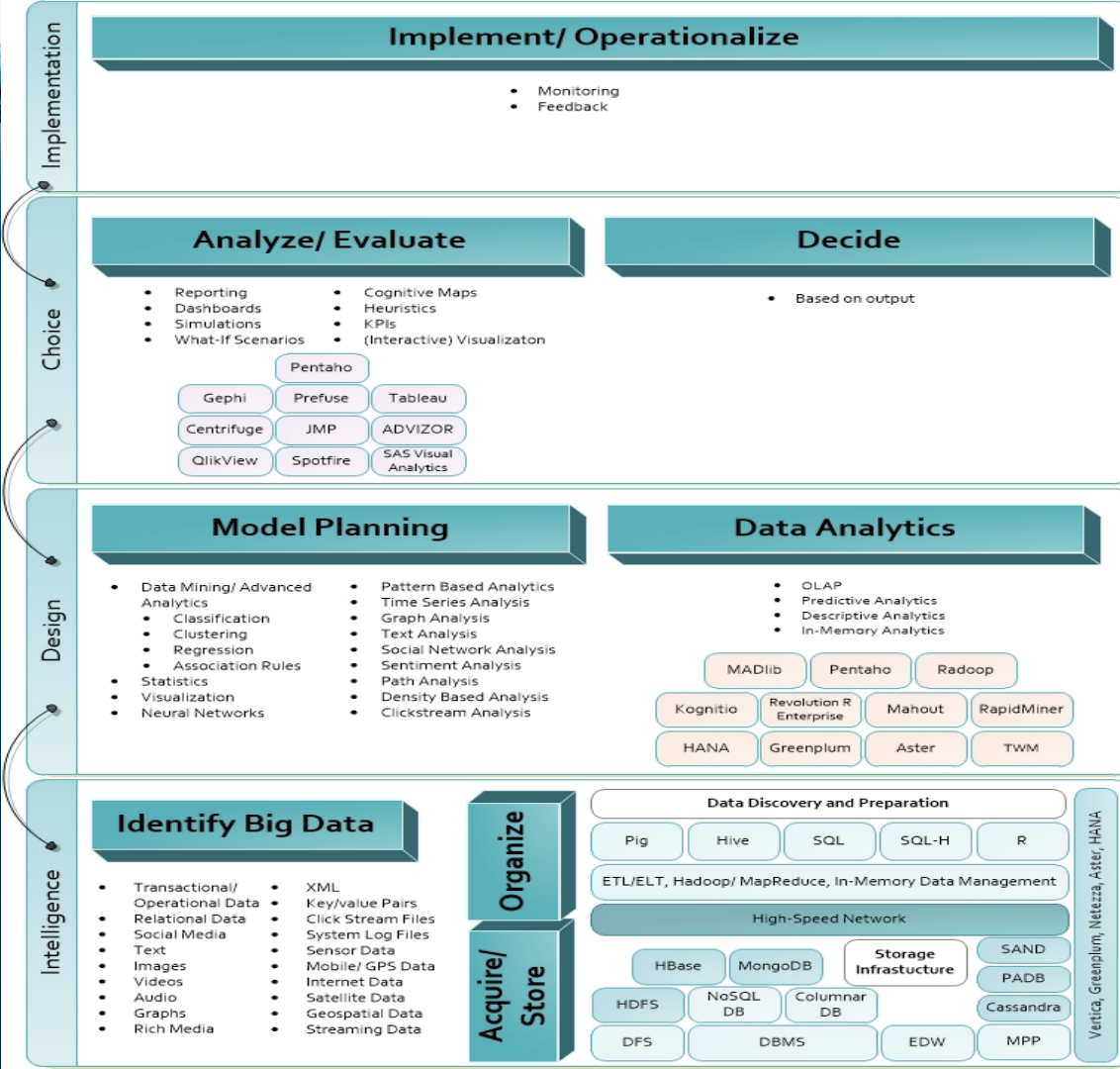
Attitudes

Data warehousing (DW)



BIG DATA-ENABLED





Intelligence



Design



Choice

CHALLENGES

Decision
Making

BDA

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The Impact

HISTORIC DECISIONS

The background of the slide features a large, jagged iceberg floating in dark blue water. The iceberg's surface is textured with various shades of blue and white, and its reflection is visible in the calm water below. The overall color palette is dominated by deep blues and whites.

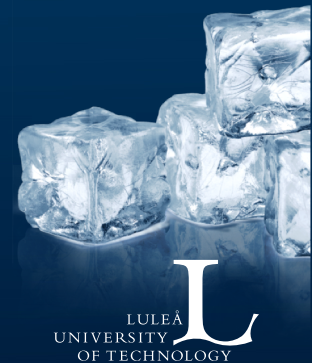
The world's best ever

**SO, WHAT ARE THE WORLD'S GREATEST DECISIONS
EVER MADE IN HISTORY OF MAN KIND?**

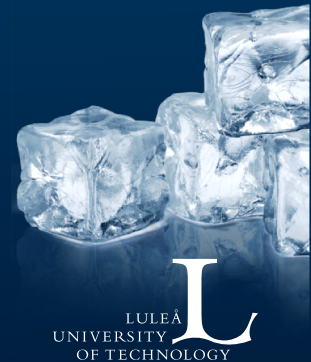


THE 75 GREATEST DECISIONS

- Queen Isabella of Spain decided to sponsor Columbus voyage in 1492, discovery of the new world.
- An ultimate, unique, R & D decision!



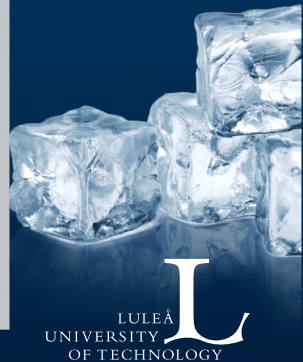
- In 1789 Benjamin Franklin (US ambassador to France) encouraged emigration of skilled workers, an early instance of poaching staff.



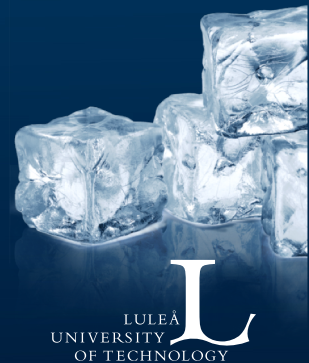
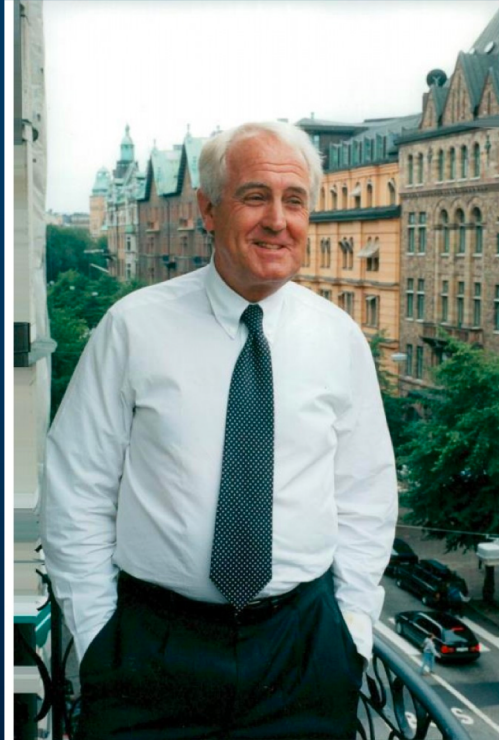
- In 1981, Bill Gates decided to license MS-DOS to IBM, while IBM ceded control of the license for all non-IBM PCs (IBM's decision is one of the worst 75). This laid the foundation for Microsoft huge success and IBM fall from grace.



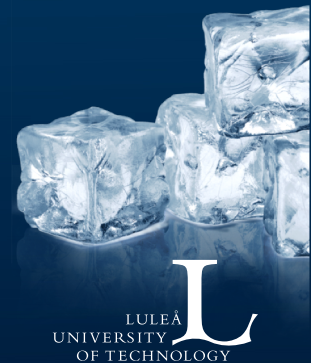
- In 1984, Michael Dell decided to sell PC's directly to customers and build to orders. Now everyone in the industry is trying to imitate Dell strategy!



- In 1981, Jan Carlzon, the CEO of SAS airline, sent 10,000 front-line managers to 2 days service seminars and 25,000 managers for 3 weeks course.
- Within 4 months, SAS was the most punctual European airline with its service-levels were rejuvenated [formerly: 14/17!].



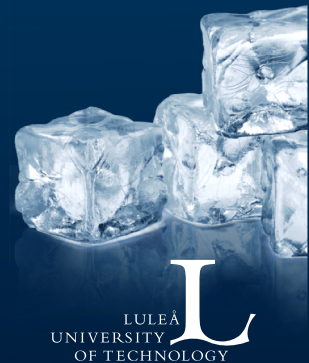
- In 1950, Frank McNamara found himself in a restaurant without money! He then decided to introduce the Diners Club Card.
- The first ever credit card which has changed the nature of buying and selling worldwide.





Fact-driven decision making

EDDM



The background of the slide features a dark blue, textured surface. At the top, there is a horizontal band showing the silhouettes of icebergs and their reflections in a calm body of water. In the bottom right corner, there is a cluster of several clear, rectangular ice cubes.

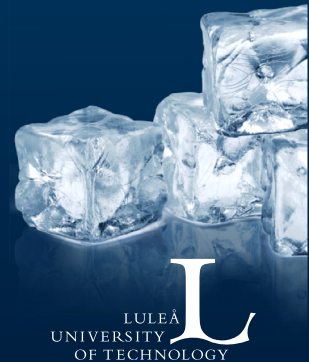
EDDM

- Evidence-driven decision making (EDDM) refers to the practice of basing decisions on the analysis of data, instead of being based on pure intuition.
- EDDM helps people make well informed decisions about policies, programs and projects by putting the best available evidence at the heart of policy development and implementation.

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AI-BASED DECISION MAKING

- A new generation of decision making is emerging where where analytics & artificial intelligence (AI) are prominent features
- EDDM is the next generation:
 - 1980's: there were decision-support systems (DSSs)
 - 1990's: data warehousing
 - 2000's: real-time data warehousing (2000s)
 - 2010's: big data analytics



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IMPACT

- Brynjolfsson et al. (2011) conducted a study of how EDDM affects performance of the company.
- In their research, a measure of EDDM that rates businesses as to how strongly they use data to make decisions across the company, was developed.
- ***The research demonstrated statistically that the more data-driven a company is, the more productive it becomes.***
- As a matter of fact, the differences are: one standard deviation higher on the EDDM scale is associated with a 4–6% increase in productivity. EDDM is correlated with higher return on assets, return on equity, asset utilization, and market value, and the relationship seems to be causal.

THE NEW DECISION MAKING



The background of the slide features a dark blue, textured surface. At the top, there are jagged, white and light blue icebergs floating on a dark blue liquid. In the bottom right corner, there is a cluster of several clear, rectangular ice cubes. The overall aesthetic is cold and technological.

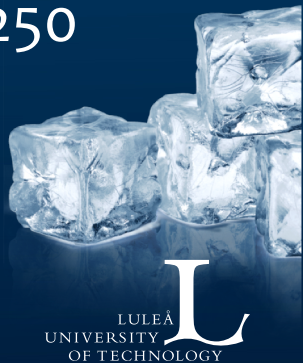
USE CASE

- In financial services, PwC has put together massive amounts of data to create secure, a large-scale model of 320 million US consumers' financial decisions.
- The model is designed to help financial services companies map buyer personas and anticipate customer behavior.
- It has enabled these financial services companies in validating real-time business decisions within seconds.



USE CASE

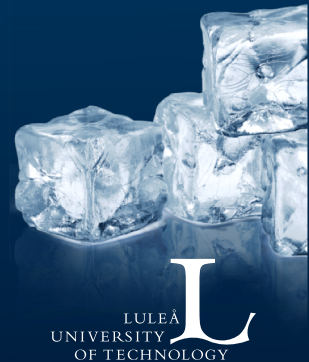
- General Electric has turned itself into a math house. It has assembled a staff in Silicon Valley to provide customers with advanced analytics to predict e.g., when equipment maintenance is due.
- In 2015, this industrial company had about 2/3 of its \$250 billion backlog in orders from services based on its mathematical intellectual property.



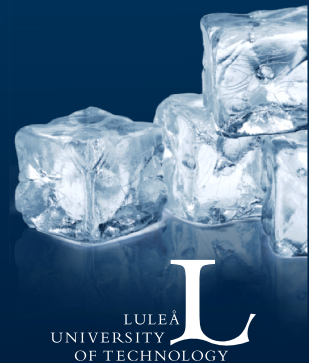
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YET TO COME ...

- Humans are now given options by the algorithmic decisions e.g., Google Maps alternative routes, *would the time come where we are just forced i.e., no more options?*
- *The Algorithm CEO: fact of fiction?*



TAKEAWAYS



The background of the slide features a blue-toned image of icebergs floating in water at the top, and several ice cubes on a reflective surface at the bottom right.

EDDM

- Management = decision making
- Decision making is getting more sophisticated, over time
- Facts, rather than feelings, become the basis for decision making
- Decision making has become a mathematical and statistical science which requires data and analytics.
- The modernized nature of the decision making process has rendered the decision making process in close proximity to both big data, big data analytics & AI.

REFERENCES

- Brynjolfsson E., Hitt L.M., and Kim H.H. Strength in numbers: How does data-driven decision making affect firm performance? Working paper, 2011. SSRN working paper. Available at SSRN: <http://ssrn.com/abstract=1819486>.
- Cairney, P., 2016. The Politics of Evidence-based Policy Making. London/New York: Palgrave MacMillan.
- Davies, P., 1999. 'What is evidence-based education?'. British Journal of Educational Studies, 47, 2, pp. 108-121.
- Davies, P., 2004. 'Is evidence-based government possible?', Paper presented at the 4th Annual Campbell Collaboration Colloquium, Washington DC.
- Ellen B. Mandinach (2012) A Perfect Time for Data Use: Using Data-Driven Decision Making to Inform Practice, Educational Psychologist, 47:2, 71-85, DOI: 10.1080/00461520.2012.667064
- European Commission/EACEA/Eurydice, 2017. Support Mechanisms for Evidence-based Policy-Making in Education. Eurydice Report. Luxembourg: Publications Office of the European Union.
- Rajeev Sharma, Sunil Mithas & Atreyi Kankanhalli (2014) Transforming decision-making processes: a research agenda for understanding the impact of business analytics on organizations, European Journal of Information Systems, 23:4, 433-441, DOI: 10.1057/ejis.2014.17
- SIMON HA (1947) Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization. Palgrave Macmillan, New York.
- SIMON HA (1956) Rational choice and the structure of the environment. Psychological Review 63(2), 129-138.
- Thomas, J.C.: Citizen, customer, partner: what should be the role of the public in public management. Public Adm. Rev. 73, 786-796 (2013).



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