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SESSION TC01 - Risk/Uncertainty + Scoring Rules

June 20, 2019, 3:00 PM - 4:30 PM

Room AS01

4 Presentations

3:00 PM - 3:00 PM	- Session Chair Ilia Tsetlin , INSEAD, Singapore, Singapore.	<input type="radio"/> Add To Itinerary
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3:00 PM - 4:30 PM	1 - So You Think that You Understand Uncertainty ? Simon French , University of Warwick, Coventry, United Kingdom. Contact: simon.french@warwick.ac.uk	<input type="radio"/> Add To Itinerary
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3:00 PM - 4:30 PM	2 - Differentiated Decision-Making as a Basis for Competitive Advantage Neil A. Hamlett , IBM, Vienna, VA. Contact: nah35@georgetown.edu	<input type="radio"/> Add To Itinerary
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3:00 PM - 4:30 PM	3 - Ranking Distributions when only Mean and Variance are Known Alfred Müller, Professor ¹ , Marco Scarsini ² , Ilia Tsetlin ³ , Robert L. Winkler ⁴ . ¹ Universität Siegen, Siegen, Germany, ² LUISS Guido Carli University, Milano, Italy, ³ INSEAD, Singapore, Singapore, ⁴ Duke University, Durham, NC, USA.	<input type="radio"/> Add To Itinerary
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Motivation for investigation.

- ▷ “Increasingly, there is less and less return on the traditional resources: labor, land and (money) capital.”
- ▷ “The main producers of wealth have become information and knowledge.”
- ▷ “The industries that have moved into the center of the economy in the last forty years have as their business the production and distribution of knowledge and information, rather than the production and distribution of things.”

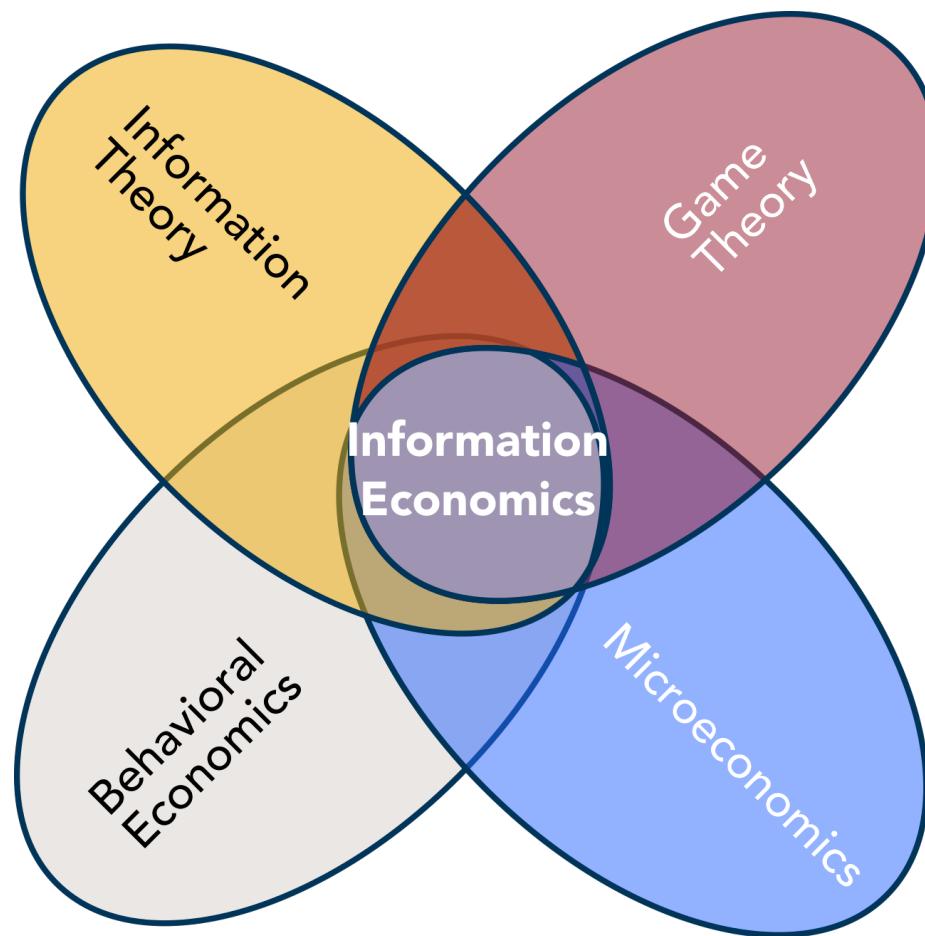
P. Drucker, *Post-Capitalist Society*,
NY: HarperCollins, 1993.

We consider a toolkit and then apply it to a case study.

- ▷ Key tools.
 - ▷ Information economics.
 - ▷ Decision analysis.
 - ▷ Theory of evidence (belief functions, Dempster-Shafer Theory).
 - ▷ Information quantification (information theory).
 - ▷ Competency-oriented frameworks for strategy (e.g, D. Teece's *Dynamic Capabilities*).
- ▷ Case study: Petroleum-extraction decision.
- ▷ Further directions.

Residing at the nexus of other disciplines, **Information Economics** seeks to attribute measurable value to distinct pieces of information.

Hamlett: "Differentiated Decision-Making for Competitive Advantage"
INFO 510 Advances in Decision Analysis, June 19-21, 2019



Key principles from principles from information economics provide foundation for a conjecture about the role information plays in competitive advantage, in general.

"The utility value of a piece of information is the difference between the expected utility ... conditioned on that information,... and the expected utility that is best in the absence of the information."

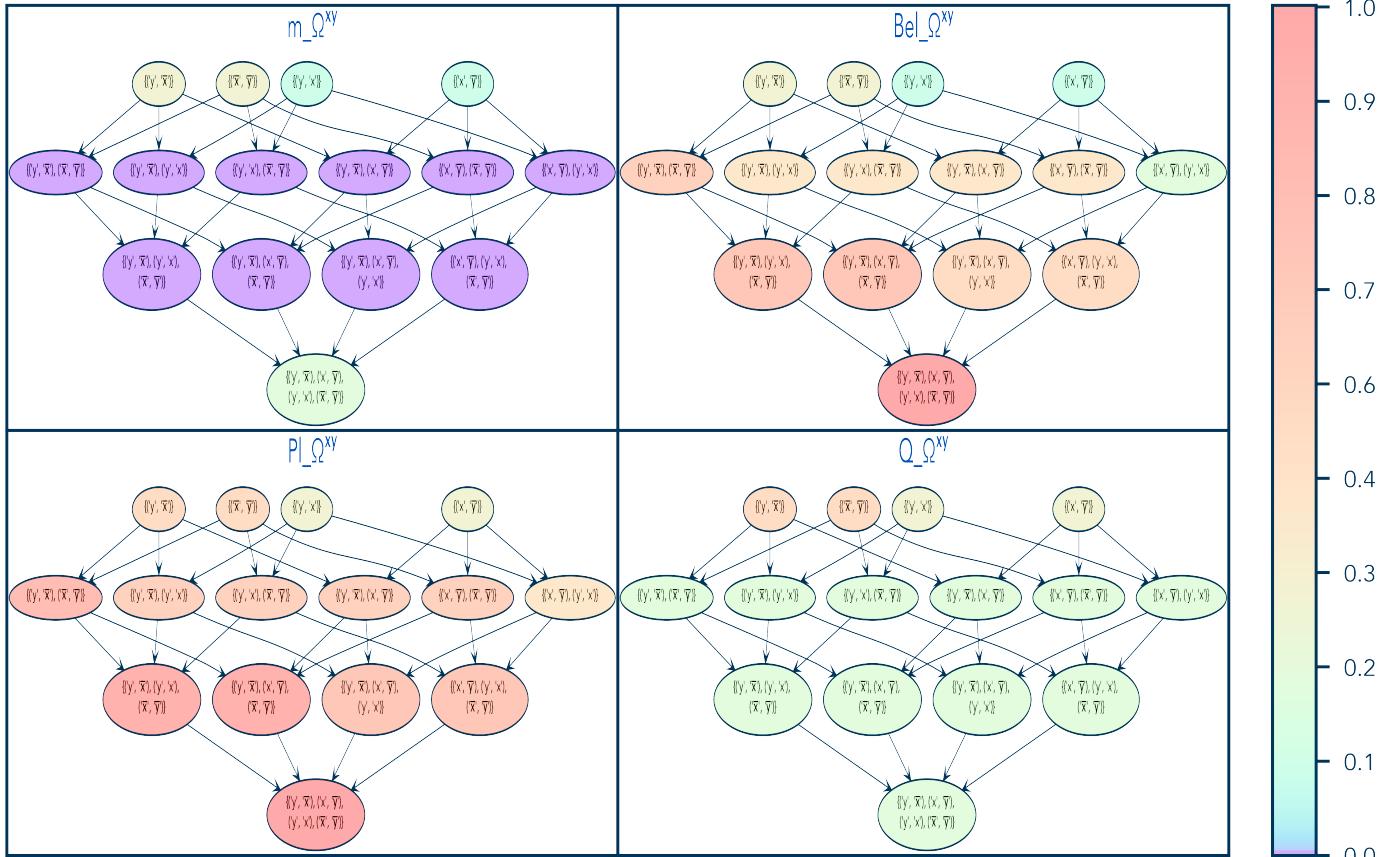
U. Birchler, M. Bütler, *Information Economics*, Routledge, 2007, p. 48.

Three distinct modes of information-differentiation are possible:

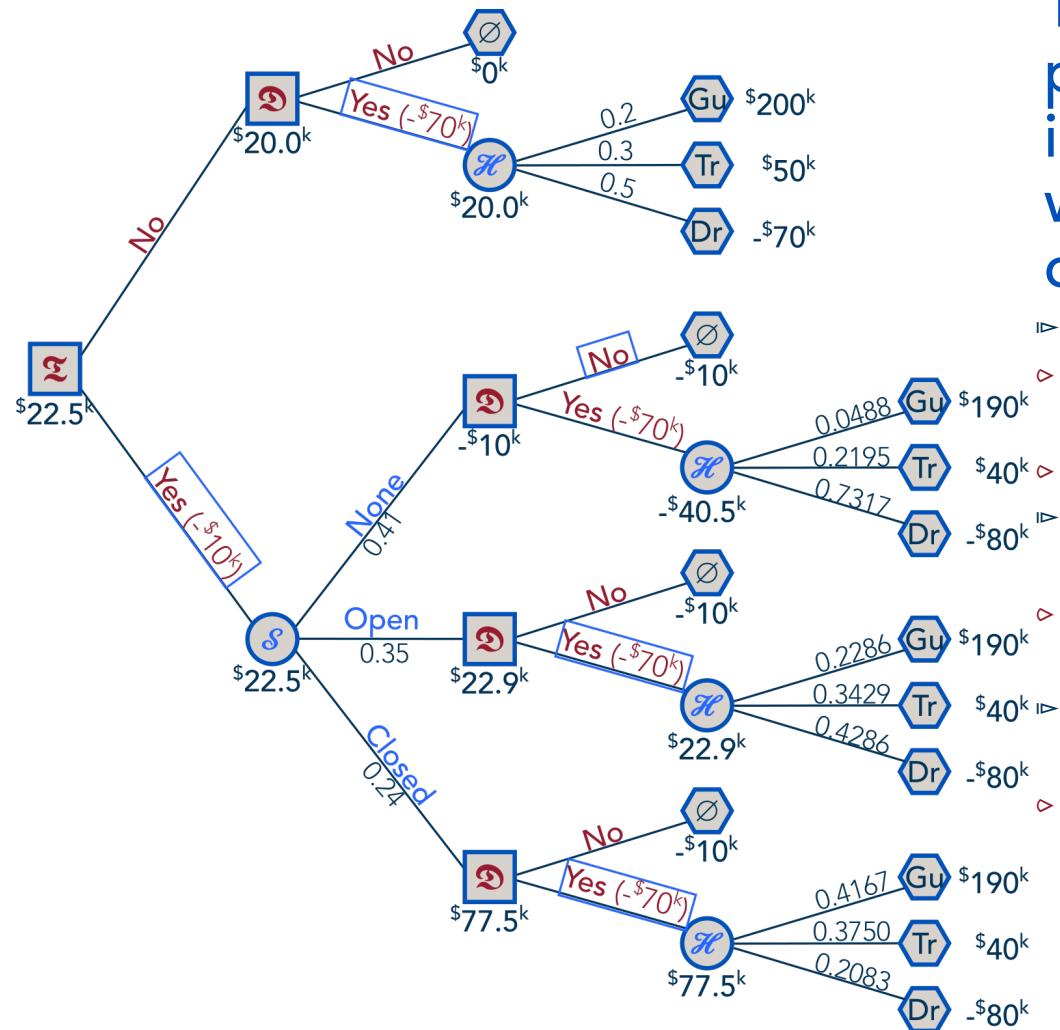
- ① *Differentiated access* arises from information others lack;
- ② *Differentiated insights* accrue from seeing things that others miss; and
- ③ *Differentiated ability to act* results from superior utility-realization competencies.

The *Theory of Evidence* — a generalization of Bayesian methods
— provides a more-complete framework for characterizing uncertainty.

Hamlett: "Differentiated Decision-Making for Competitive Advantage"
INFORMS Advances in Decision Analysis, June 19-21, 2019

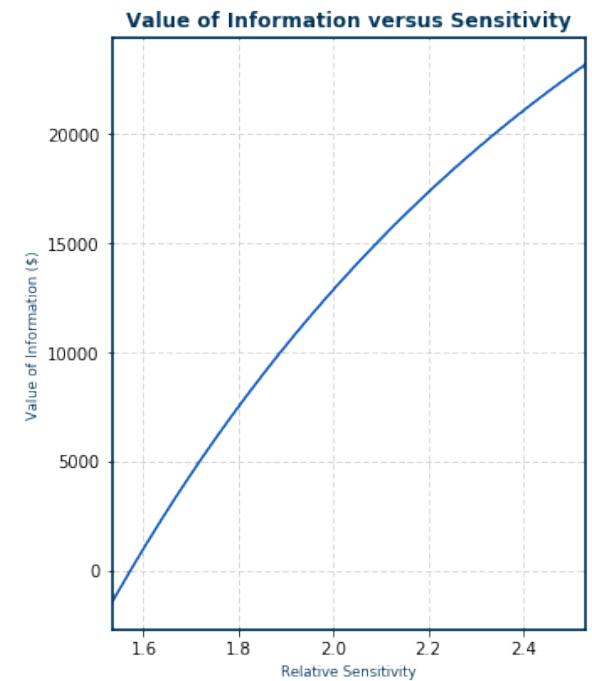
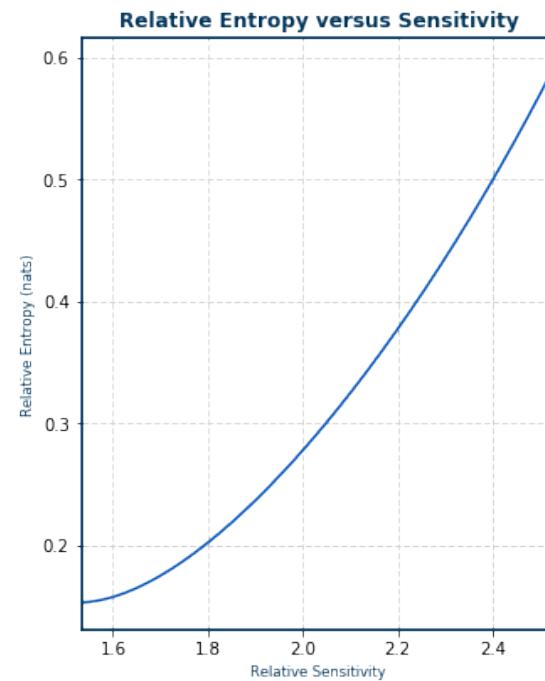
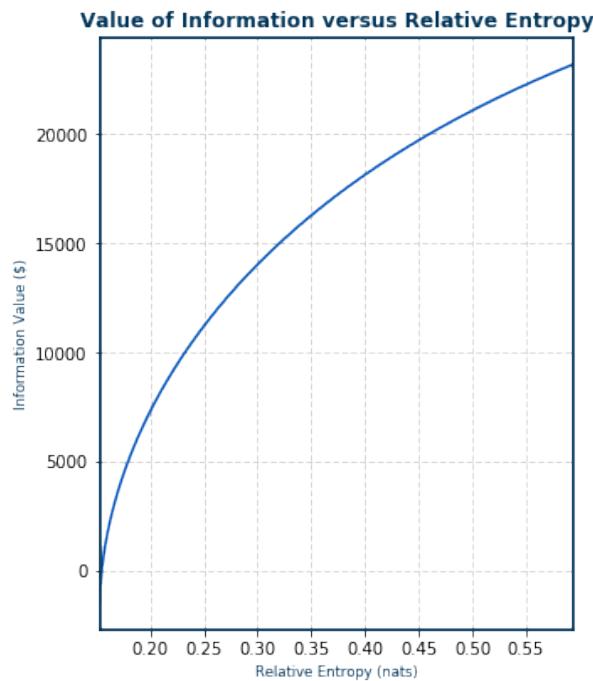


The "oil-drilling" case provides a benchmark illustration that resonates with the practitioner community.



- ▷ Two key decisions:
 - ▷ Whether to test (geophysical survey of target field); and
 - ▷ Whether or not to drill.
- What is learned from testing constitutes the essential information-valuation proposition.
- Information from testing yields an expected-net-utility benefit of \$12.5^k.
- The uncertainty remains fuzzy than this crisp-value representation suggests.
- The expected-net-return distributions from the test/no-test scenarios overlap considerably.

A multi-attribute parameter analysis of our case corroborates in a coarse sense the essential conjecture regarding the value of information.



Possible further directions.

- ▷ Collaborate with practitioner-community representative on more-sophisticated case study for INFORMS October 2019 annual meeting.
- ▷ Extend the decision-tree technique into a more-general graphical methodology.
(Shenoy's valuation-network methodology?)
- ▷ Incorporate recent methods combining fuzzy logic with DS Theory.
- ▷ Consider applicability to adjacent questions of strategy, organizational learning.