Avoiding Type III Errors:
Overcoming Competency Traps, Seizing New Opportunities

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Presented at

Workshop on Information Systems & Technologies

December 17, 2018

When Do Type III Errors Happen

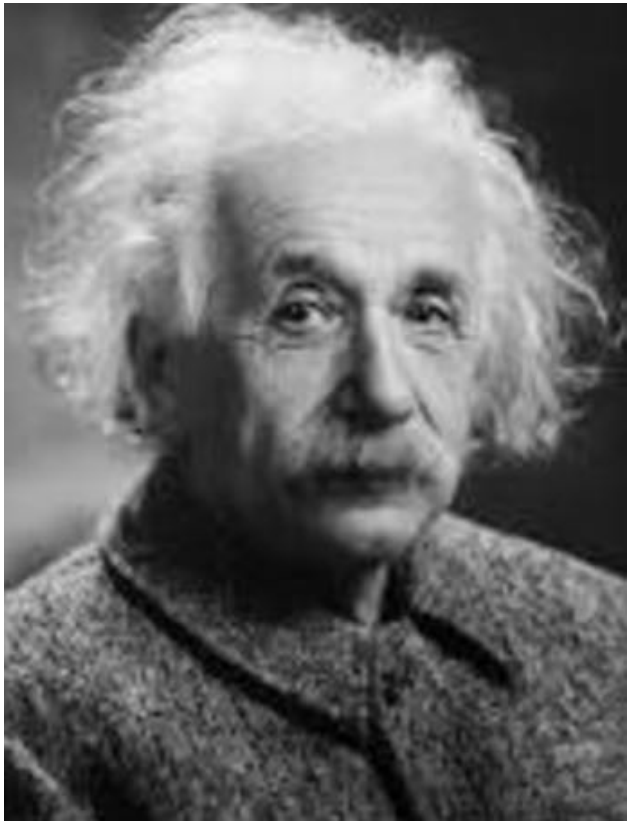
A researcher answers the wrong question using the right methods

Mitroff, I. I., and Silvers, A. 2009. Dirty Rotten Strategies: How We Trick Ourselves and Others into Solving the Wrong Problems Precisely, Stanford, CA: Stanford University Press

EDITOR'S COMMENTS

Avoiding Type III Errors: Formulating IS Research Problems that Matter

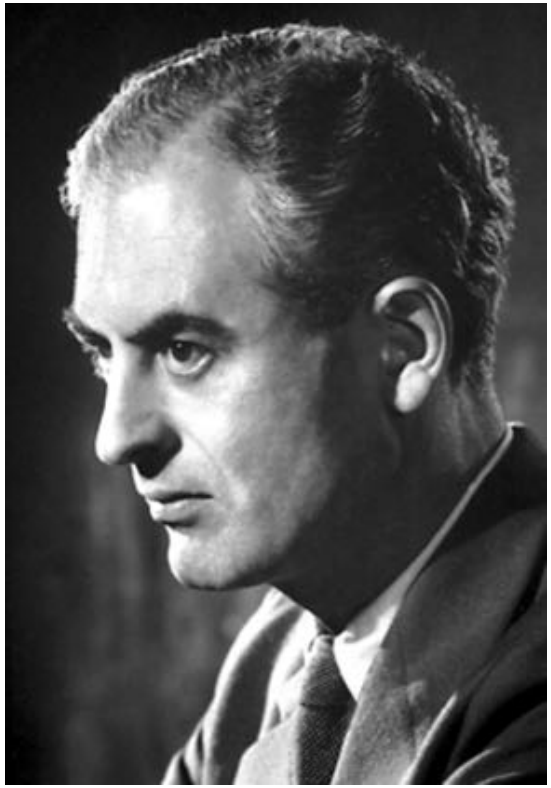
Formulate the Research Problem So the Answer to the Question Will Matter



Albert Einstein

"The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill"

Important Vs. Interesting Problems



Any scientist of any age who wants to make important discoveries must study **important** problems. Dull or piffling problems yield dull or piffling answers. It is not enough that a problem should be interesting—**almost any problem is interesting if it is studied in sufficient depth** ... **the problem must be such that it matters what the answer is—whether to science generally or to mankind**.

P.B. Medawar
Nobel Laureate in Medicine and Physiology, 1979

Types of Value that the Answer to the Research Question Can Create

H.A. Simon
Nobel Laureate in Economic Sciences, 1978

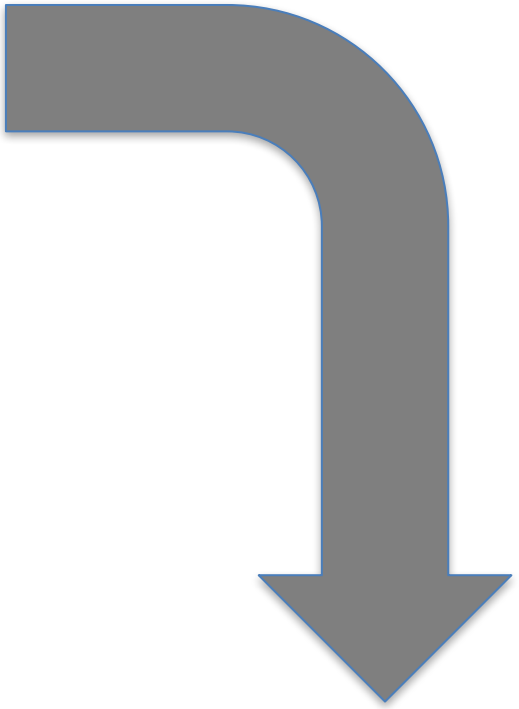
1. **Scholarly**, advancing the area under study in fundamental ways that influence future progress

2. **Practical utility**, changing the state of affairs in the world

3. **Aesthetics**, arising from *powerful simplicity*

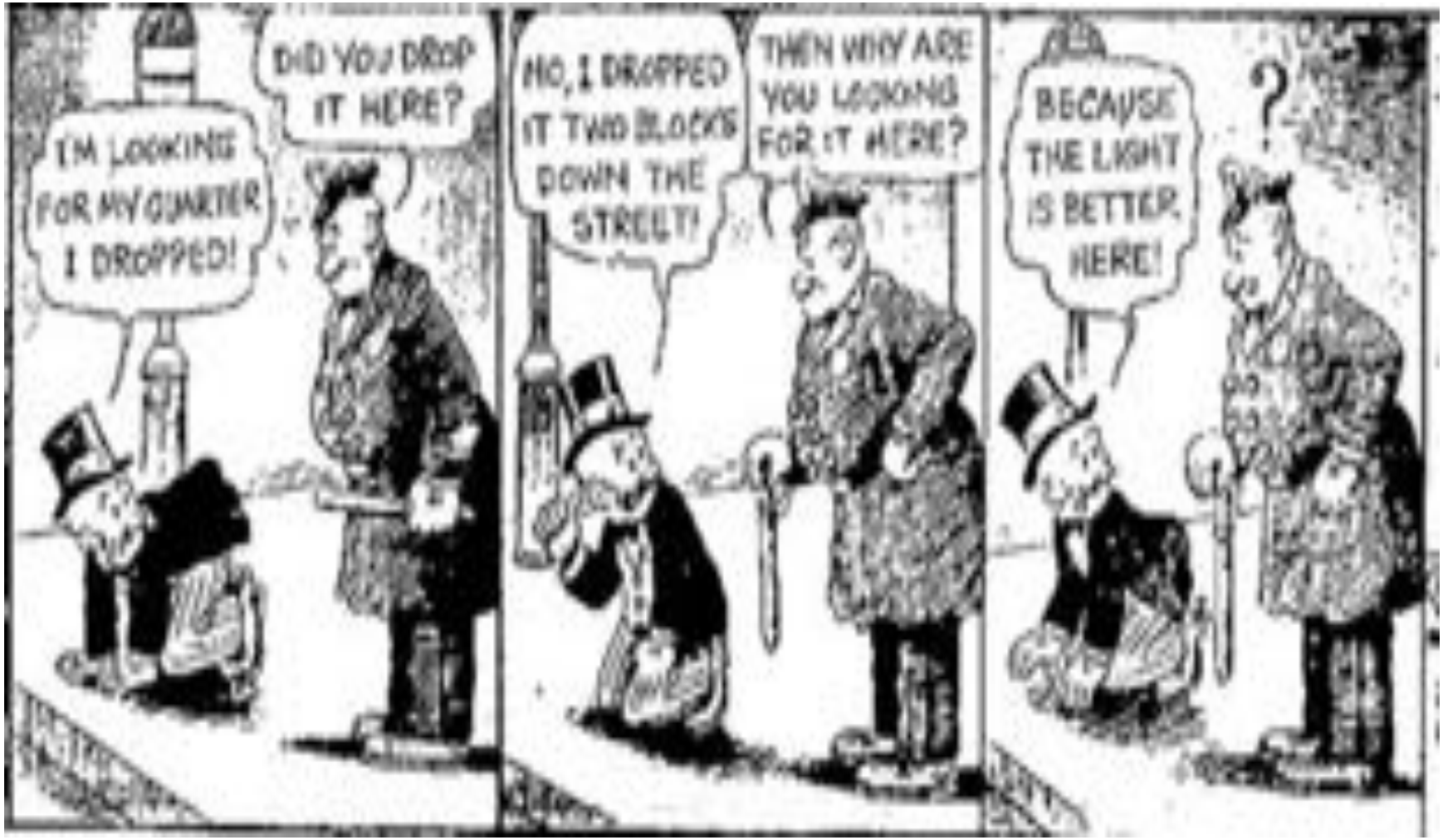
Simon, H. A. 1991. "Random Thoughts on Methods of Research," Unpublished Manuscript, Carnegie Mellon University, Pittsburgh, PA.

Formulate the Research Problem So the Answer to the Question Will Matter



Safeguard Against Key Risks in Formulating Research Problems

First, The Streetlight Effect



CAUTION

Maintain focus on important problems, not easy-to-access datasets

The Streetlight Effect
Exacerbated By Easy-to-Access Data

Alibaba.com
Global trade starts here.™

AliSource

SAMSUNG

amazon

The White House
Office of the Press Secretary

For Immediate Release — May 09, 2013

Executive Order -- Making Open and Machine Readable the New Default for Government Information

EXECUTIVE ORDER

- - - - - - -

MAKING OPEN AND MACHINE READABLE THE NEW DEFAULT FOR GOVERNMENT INFORMATION

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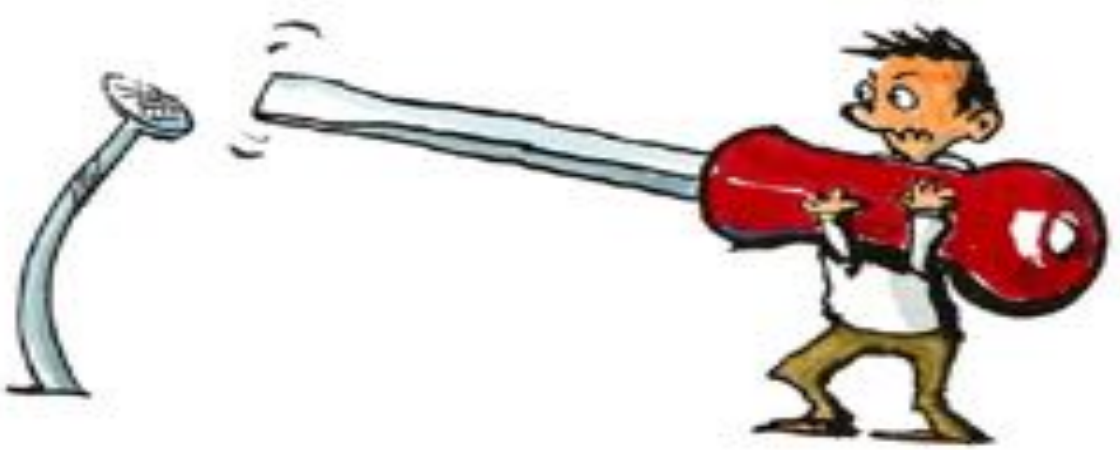
The Streetlight Effect: Exacerbated By Have-Hammer-Will-Travel

The Law of the Hammer



If the only tool you have is a hammer,
everything looks like a nail.

Abraham Maslow - The Psychology of Science - 1966

Second, Gap-Spotting and Gap-Patching—But Does the Gap Matter

Third, Affirming Gravity Works in My Kitchen

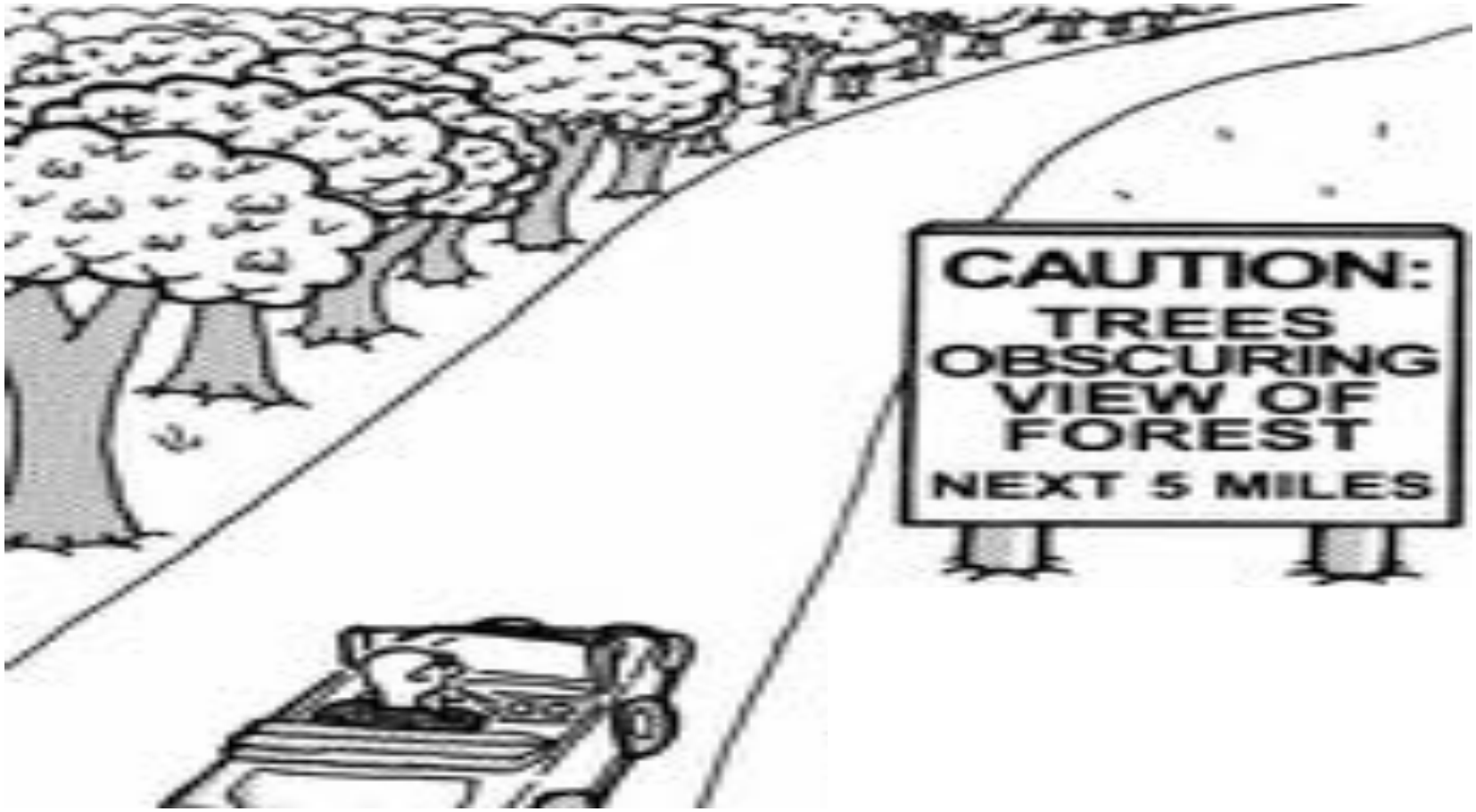
- **Reifying well-established theories or models in a new context**
- **Concluding that the solution works in a different setting**
- **Straight-up applications of knowledge from another discipline**

"Novelty is an essential component of contributions to science. No prizes are awarded for being second to discover a scientific law" (Simon 1991).

Affirming Gravity Works in My Kitchen: Exacerbated by Chasing Novel Digital Contexts

Novelty of context in relation to the archetypal problem?

Fourth, Missing the Forest for the Trees



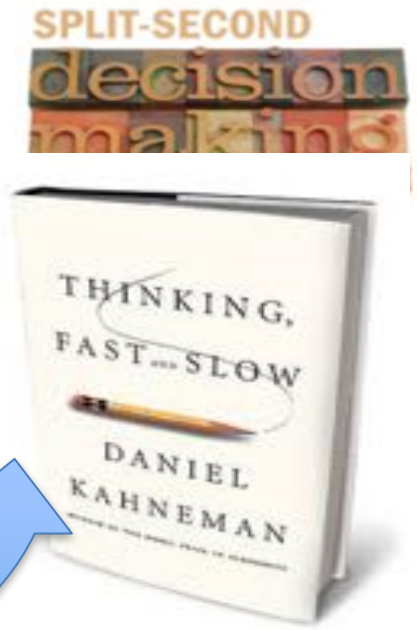
EDITOR'S COMMENTS

Seeing the Forest for the Trees

MIS Quarterly Vol. 41 No. 4 pp. iii-vii/December 2017

Transcend the Immediate Problem Context

Connection With Archetypal Problem?



Key Risk: Myopic Problem Formulation, Overlooking the Archetypal Problem

Sole focus on an immediate concrete problem without evaluating how it relates to archetypal problem

How IS (along with other means) can persuade individuals to modify behaviors to comply with a new set of behavioral norms necessary to attain goals

How IS (along with other means) can persuade patients with chronic diseases to make behavioral modification to comply with therapy

How intelligent wearable devices can persuade diabetic patients to make necessary behavioral changes to comply with therapy

Abstracting

Key Risk: Hyperopic Problem Formulation, Overlooking Distinctive Contextual Features

Sole focus on abstraction, without evaluating how distinctive contextual features challenge knowledge for archetypal problem

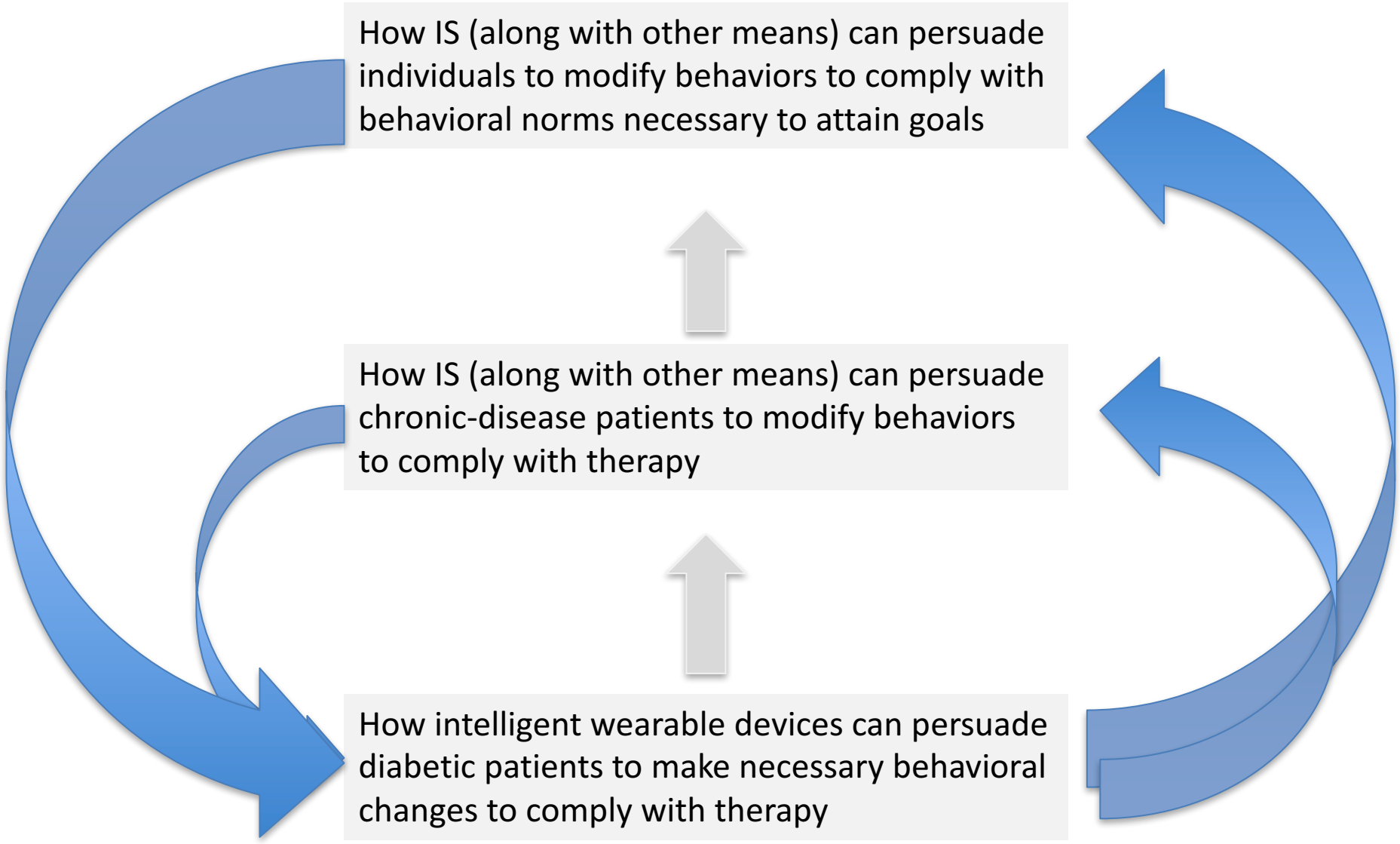
How IS (along with other means) can persuade individuals to modify behaviors to comply with a new set of behavioral norms necessary to attain goals

How IS (along with other means) can persuade patients with chronic diseases to make behavioral modification to comply with therapy

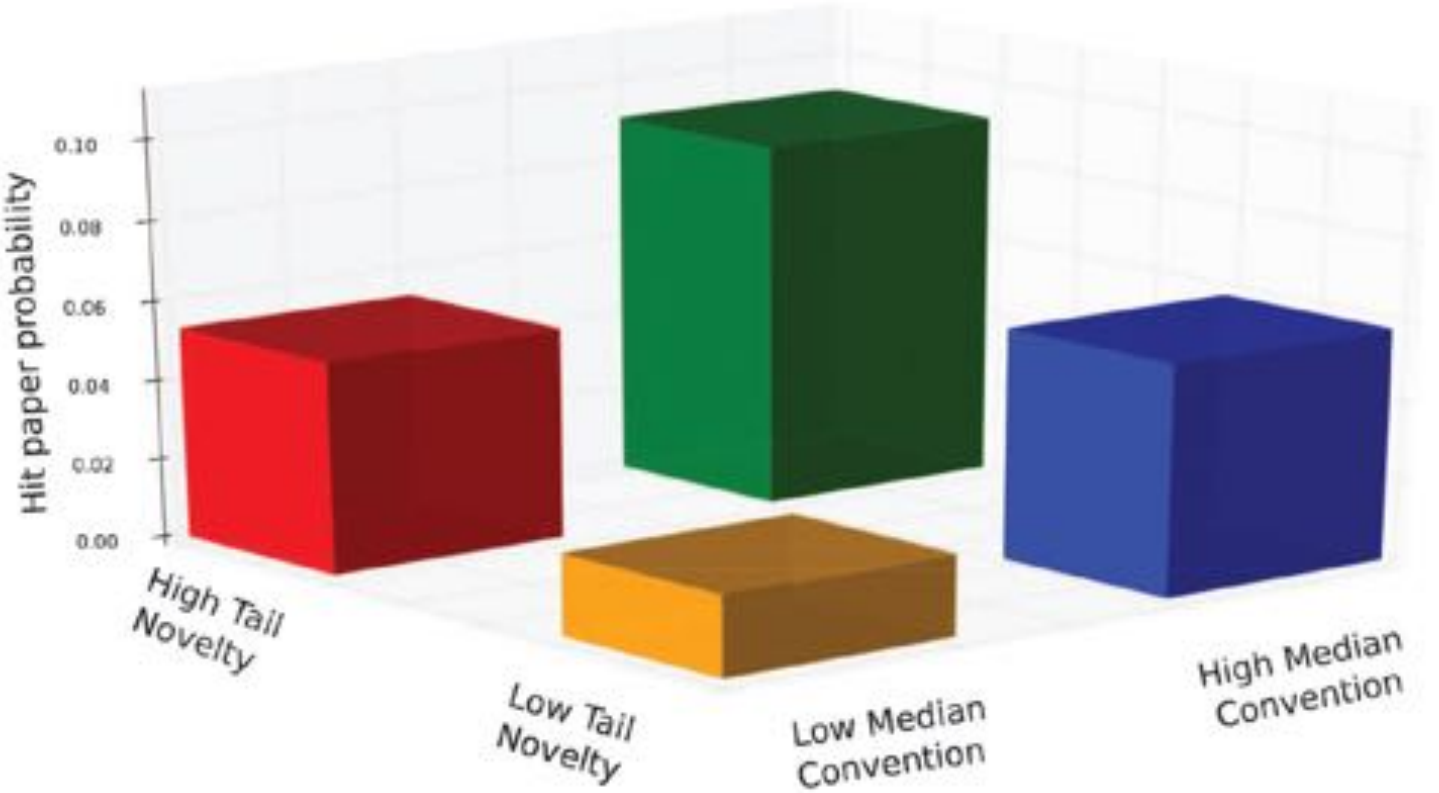
How intelligent wearable devices can persuade diabetic patients to make necessary behavioral changes to comply with therapy

Contextualizing

Managing the Risk of Over- or Under-Problematizing



Scholarly Impact: Connecting Novelty With Accreted Knowledge

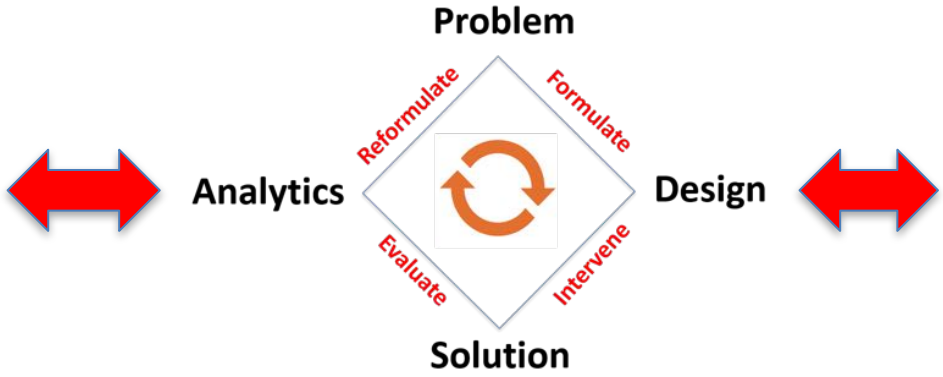


Atypical Combinations and Scientific Impact

Brian Uzzi,[1,2] Satyam Mukherjee,[1,2] Michael Stringer,[2,3] Ben Jones[1,4]*

***Science*, 2013**

Fifth, Linear Process to Formulate and Solve Problems



- **Diagnostic errors: 6- 17% of adverse events**
- **28% of diagnostic errors due to cognitive errors that lead to premature closure**

Source: jointcommission.org (October 2016)

Iteratively designing and evaluating solutions in context to mitigate premature closure

Iterative Process to Formulate and Solve Problems: Leveraging Context-Aware Use Traces

Geospatial, temporal traces

- Transactions
- E-mails
- Text messages
- Social media posts
- Web searches
- Social networks

Iterative Process to Formulate and Solve Problems: Large-Scale Rapid Experimentation

		Frequency	
		Low	High
Throughput	Low		
	High		

- **High throughput** involving millions of subjects
- **High frequency** experimentation
- **Parallel experiments**
- **Light-weight** interventions
- **Radical shift** in hypotheses-to-conclusion scale and speed

Formulate the Research Problem So the Answer to the Question Will Matter

Safeguard Against Key Risks in Formulating Research Problems

Overcoming Competency Traps

Rethinking Problem Formulation With Cross-Paradigm Combinative Practices

EDITOR'S COMMENTS

Beyond Outdated Labels: The Blending of IS Research Traditions

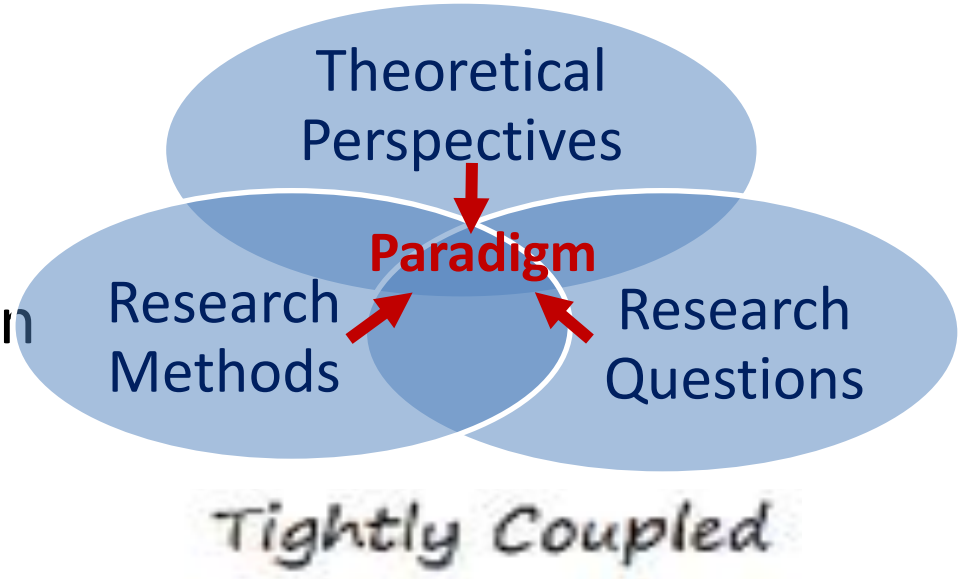
MIS Quarterly Vol. 42 No. 1 pp. iii-vi/March 2018

The Traditional Labels

- **Tight coupling**:
  - Types of research questions
  - Informing perspectives, reference disciplines
  - Research methods

- Field mapped into few paradigms: behavioral, design science, economics, organizational

- Labels reflected domain of contribution **and** approaches

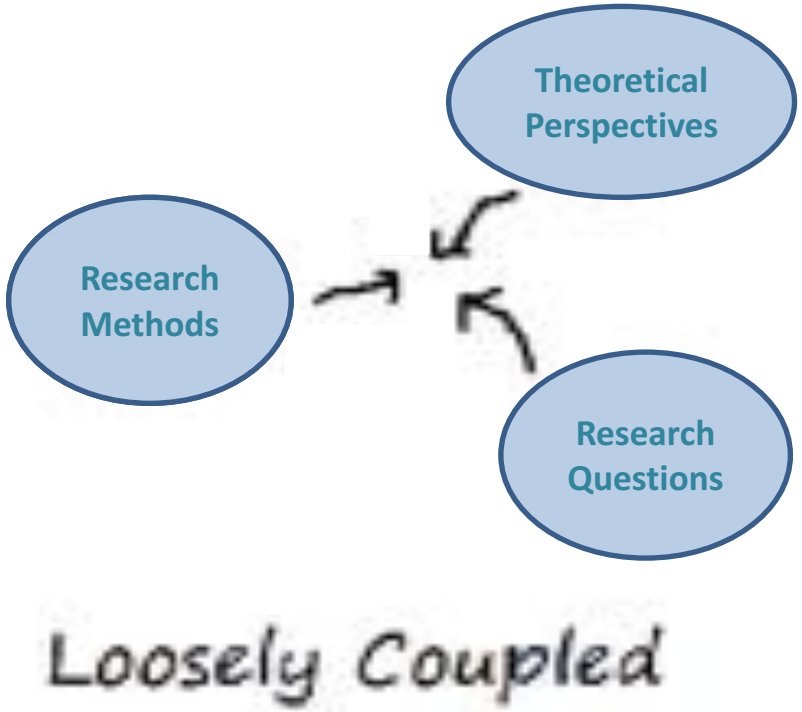


Breaking the Mold of Traditional Labels

Forces Propelling Diversity in Research

- Complexity/scope of IS phenomena
- Availability of new types of data and methods
- Diversity of research teams
- Training of scholars

Blending of Traditions: Era of Loose-Coupling



What We Are Seeing: Old Labels Not Capturing New Genres

Behavioral economics combining behavioral and economics theories

Behavioral issues investigated using a combination of psychometrics, econometrics, network analysis, qualitative methods, and computational approaches

"Not that Type of Design Science"

Loose-coupling of

- Problems that are addressed
- Types of artifacts that are designed and evaluated
- Search processes that are used to create and refine the IT artifacts to solve problems
- Types of knowledge contributions that are made

Table 1. Cross-Paradigm Combinative Practices in IS Research			
		Non-Paradigmatic Practices	
		Theoretical Perspective	**Method**
Paradigmatic Practices	**Theoretical Perspective**	**Cross-Paradigm Theoretical Combination** ***Motivation***: Challenge assumptions, redefine boundary conditions, re-conceptualize constructs and relationships, and gain a more holistic understanding through cross-paradigm theorizing	**Paradigmatic Theory-Non-Paradigmatic Method Combination** ***Motivation***: Develop, evaluate, and refine a paradigmatic theory by applying a method from another paradigm to observe, analyze, and interpret phenomena in novel ways
	Method	**Paradigmatic Method-Non-Paradigmatic Theory Combination** ***Motivation***: Leverage a theoretical perspective from another paradigm to illuminate the application of a paradigmatic method in the research process	**Cross-Paradigm Methods Combination** ***Motivation***: Generate complementary insights by applying methods with different objectives, assumptions, data requirements, and processing approaches

Table 1. Cross-Paradigm Combinative Practices in IS Research			
		Non-Paradigmatic Practices	
		Theoretical Perspective	**Method**
Paradigmatic Practices	**Theoretical Perspective**	**Cross-Paradigm Theoretical Combination** ***Example***: Behavioral and economics theories on influence mechanisms combined to understand how a platform's design affects the propagation of social influence in online networks	**Paradigmatic Theory-Non-Paradigmatic Method Combination** ***Example***: Behavioral/economics IS theoretical perspectives combined with computational methods such as topic modeling, text mining, and image recognition to develop measures of constructs
	Method	**Paradigmatic Method-Non-Paradigmatic Theory Combination** ***Example*:** IS design science research combined with behavioral theoretical perspectives on IS use to inform, evaluate, and refine artifact design; insights can also be used to revise the informing theoretical perspectives.	**Cross-Paradigm Methods Combination** ***Example***: Econometric analysis of archival data for causal identification combined with primary data collected using surveys or interviews to illuminate the underlying mechanisms; Grounded theory method to discover concepts and relationships combined with computational approaches applied to large corpus of text to discover topics and relationships.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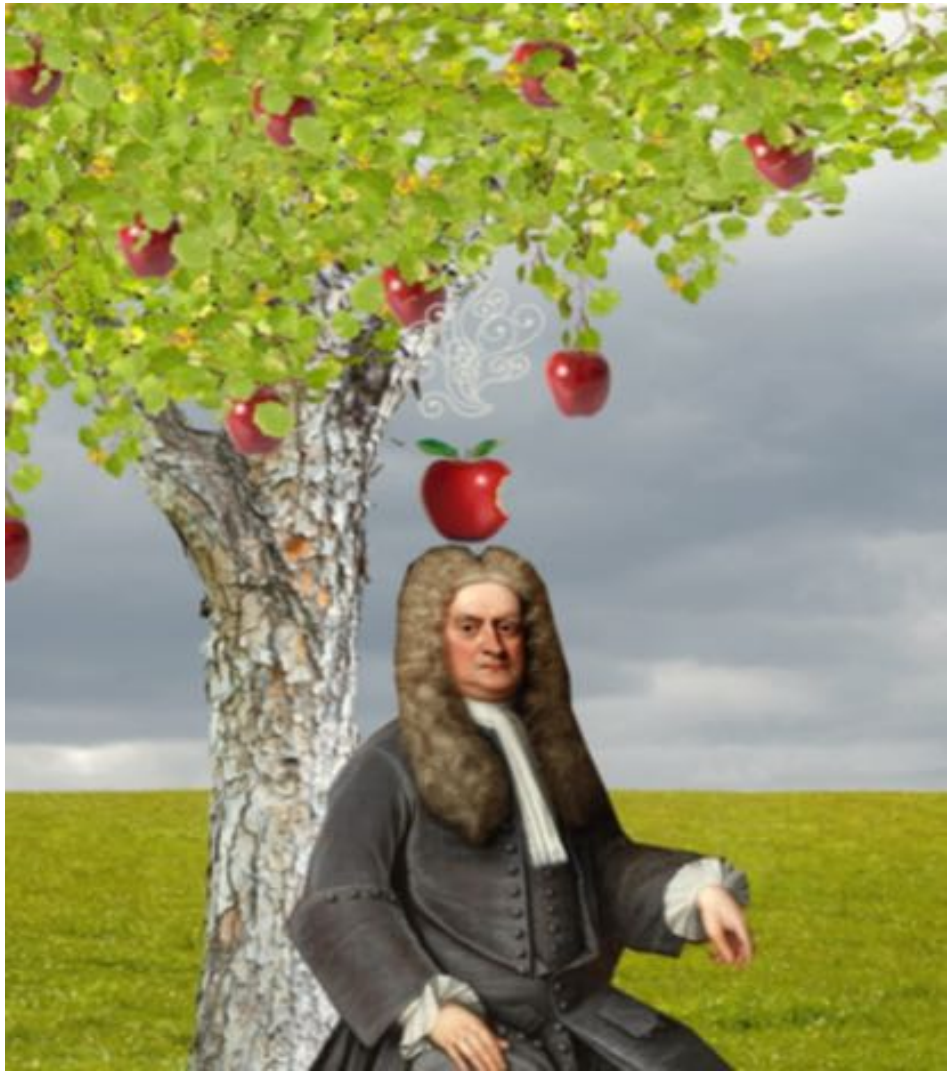
Chance Favors the Connected Mind

Role of Individual Preparedness

In the fields of observation chance favors only those minds which are prepared.

~ Louis Pasteur

The Prepared Mind:
Lone Genius, Suddenly Struck By Inspiration



Eureka moment of sudden clarity!

Johnson, S. 2010. Where Good Ideas Come From: The Natural History of Innovation, New York: *Riverhead* Books, Penguin Group.

The Connected Mind: The Utility of Liquid Networks

- **Networked, collaborative**
- **Triggers, not search and retrieval**
- **Exaptation, not mutation**

Johnson, S. 2010. Where Good Ideas Come From: The Natural History of Innovation, New York: *Riverhead* Books, Penguin Group.

Developing the Connected Mind

H.A. Simon
Nobel Laureate in Economic Sciences, 1978

Not merely a matter of constituting a team with members having complementary specializations in knowledge and skills, but requires "individual members of the team to become multi-disciplinary in knowledge, if not skills" (Simon 1991, p. 10).

Simon, H. A. 1991. "Random Thoughts on Methods of Research," Unpublished Manuscript, Carnegie Mellon University, Pittsburgh, PA.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