# Scientific Research in Information Systems: A Beginner's Guide (2<sup>nd</sup> edition)

**Teaching Materials** 

Created by Professor Jan Recker

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2<sup>nd</sup> edition, Springer.

Available at Springer, Amazon, and other booksellers

# Potential Course Design on Basis of the Book

### **Course Overview**

This course will provide an introduction and overview of scientific research in Information Systems. It will discuss elementary scientific principles of research, explore key decisions in identifying research questions, designing a study, developing and using theory, research methods, and discuss challenges in paper writing, publishing, and scientific ethics.

■ The course will be taught in an interactive style where we jointly discuss learnings, critique articles, attempt to apply what we have learned to improve and extend our own research and publications, and work together to reach a deeper understanding of how to produce significant Information Systems research. The course will feature readings, lectures as well as student presentations and discussions in the classroom.

## **Learning Outcomes**

### Students learn to...

- ...understand principles of scientific inquiry such as replicability, independence, and precision.
- …evaluate phenomena and research problems of interest to information systems scholars
- ...apply discipline and technical knowledge to analyze and evaluate scientific processes and outcomes in information systems.
- ... distinguish, evaluate, and compare different research methods used in information systems research
- ...frame important research questions and design research studies appropriate to address these research questions.
- ...develop written communication skills to structure, explain and defend scientific thinking.
- ...appreciate ethical issues in planning, conduct, and publishing of information systems research.

### **Possible Schedule**

Week	Topic	Lecture	Practical
1	Scientific principles	3h	
2	Research questions	3h	
3	Practical session		3h
4	Research design	3h	
5	Quantitative methods	3h	
6	Practical session		3h
7	Qualitative methods	3h	
8	Design methods	3h	
9	Practical session		3h
10	Computational and mixed methods	3h	
11	Scientific Writing	3h	
12	Practical session		3h
13	Ethics	3h	
14	Recap and exam preparation	3h	

# **Possible Assignments**

### Exercise #1

- Presentation on an assigned seminal paper
  - The presentation should be no longer than 10 minutes and should instigate a classroom discussion.

## **Possible Assignments**

### Exercise #2

- Written critique of an assigned research paper.
  - The critique should be between 2 and 4 pages long and should examine significance of the study, application and development of theory, and choice and application of research method. It should end in recommendations for improving the study through alternative/additional choices for theory, design or method.
  - This exercise can be adapted to function as a virtual journal paper review:
    - Your critique must include:
      - a recommendation to the editor (accept, minor revisions, major revisions, reject),
      - a clear description of the major areas for improvement in the paper,
      - recommendations for how to address them.
    - Your review will be assessed based on the extent to which your recommendation and areas for improvement fairly reflect the paper's quality and whether your recommendations are feasible and likely to help the paper.

### **Overview**

### Content

**Part 1: Basic Principles of Research** 

Part 2: Conducting Research

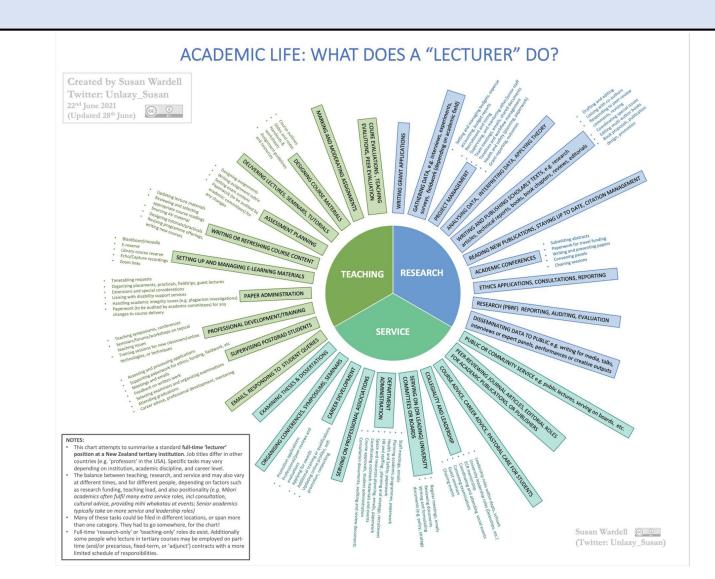
Part 3: Publishing Research

# Chapter 1: Introduction to Information Systems Research

# Why are you studying information systems?



# What does a professor do?

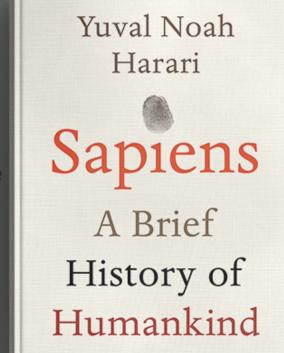


# Let's get going: What is Research?

# What is a famous study you have heard of?

# The Scientific Revolution: Mankind realizes they do not know everything.

- a) The willingness to admit ignorance. Science assumes that we don't know everything. Even more critically, it accepts that the things that we think we know could be proven wrong as we gain more knowledge. No concept, idea or theory is sacred and beyond challenge.
- b) The centrality of observation. Having admitted ignorance, science aims to obtain new knowledge. It does so by gathering observations and then using formal tools such as logic or mathematics to connect these observations into comprehensive theories.
- c) The acquisition of new powers. Science is not content with creating theories. It uses these theories in order to acquire new powers, and in particular to develop new technologies.



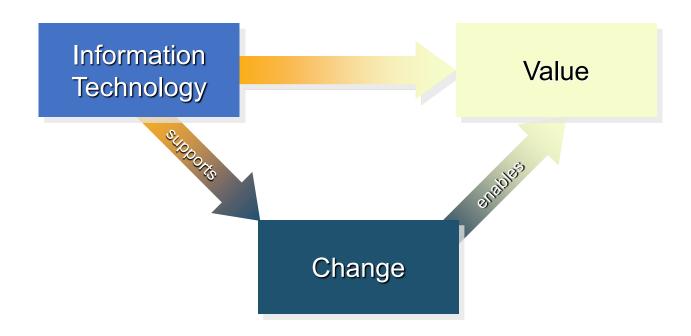
# What are we researching in IS?

What is Information Systems research about?

Give some examples of IS research that you know of.

# What are we researching in IS?

What is Information Systems research about?



### Definition of IS research

The information systems research discipline is concerned with examining the development, use, and impact of digital information and communication technology.

# Two key aspects of that definition (1)

 A focus on digital technologies, that is, technologies that rely on digitisation, the encoding of analogue information into digital format (essentially, bits and bytes that contain 0s and 1s).

This makes IS research dynamic and fast-moving: these artefacts change all the time!

# Two key aspects of that definition (2)

- The study of **development**, **use**, **and impacts** is very broad and heterogenous:
- What is development
- What do we mean by use?
- What could be impacts?

This makes IS research diverse and challenging: different theories and methods are needed to study all these aspects!

# There are many ways of doing research on Information Systems

 Scholars in information technology, software engineering, and computer science study the technical and computational attributes of digital technology as such.

Scholars in behavioural, cognitive, and psychological sciences study individuals' exposure, use, appropriation, and general behaviours [within digital technology domains].

 Scholars in organisational science, management, and business study how corporate environments shape, and are shaped by, digital technology.

 Economists study the large-scale effects of digital technology diffusion and innovation on organisations, markets, and societies.

### Which BBT Character are You?

### Theoretical Scientist

- Mostly <u>developing theory</u>
- Example
  - Seidel, Recker, Vom Brocke (2013): Sensemaking and Sustainable Practicing
  - Developing an account for how sustainability initiatives evolve through the use of IS

### Experimental Scientist

- Mostly <u>evaluating theory</u>
- Example:
  - Recker et al. (2011): Do Ontological Deficiencies in Modeling Grammars Matter?
  - Developing and empirically testing the consequences of ontological characteristics of certain attributes on behaviours

### Engineer

- Applies theory in the <u>design of artefacts</u>
- Example
  - Recker, J. (2021). Improving the State-Tracking Ability of Corona Dashboards
  - Using state-tracking theory for identify principles for making Corona Dashboards more effective







### Types of research

### Conceptual research

 is concerned with an analysis of a problem at hand without a commitment to any (technologically-driven) solutions

### Formal research

Is concerned with describing concepts in mathematical terms (so as to remove any
potential ambiguity with respect to their interpretation) and presenting theorems with
corresponding proofs to provide more insight into these concepts

### Types of research

### Technological research

- Is concerned with the development of sophisticated software artifacts to prove that certain ideas can indeed be realized and to reason about the comparative strengths and weaknesses of various architectural approaches
- E.g., Workflow Systems (YAWL) or Process Mining (Celonis)

### Experimental research

- typically addresses a limited set of properties of a phenomenon (e.g., a property of a technology or person, or a method), and examine these properties in controlled settings
- E.g., experiments in medicine or physics

### Types of research

### Empirical research

- sets off to study phenomena in real-life practice, and to build or confirm theories about how the phenomena came to be about.
- can be based on case studies, surveys, action research, grounded theory, or other methods.
- E.g., Technology Acceptance, Success factor models

# What impacts are we studying - does IS research matter?

The "knowledge" a business school sells is "vulgar" and "stupid," that business ethics and corporate social responsibility are mere "window dressing," a "fig leaf to cover the conscience of B-school deans," and that the business school will most likely be the "most ostentatious building" on a university campus.

Parker [...] claims that business schools are essentially "places that teach people how to get money out of the pockets of ordinary people and keep it for themselves. In some senses, that's a description of capitalism, but there is also a sense here that business schools actually teach that 'greed is good."

https://poetsandquants.com/2018/04/30/another-cheap-shot-at-the-value-of-an-mba/



# What are significant challenges?







SPECIAL ISSUE: ICT AND SOCIETAL CHALLENGES

### COMBATING INFANT MORTALITY IN RURAL INDIA: EVIDENCE FROM A FIELD STUDY OF EHEALTH KIOSK IMPLEMENTATIONS<sup>1</sup>

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The United Nations' Millennium Development Goals listed high infant mortality rates as a major problem in developing countries, especially in rural areas. Given the powerful information dissemination capabilities, information and communication technologies (ICTs) have been suggested as interventions to build infant care awareness and to modify healthcare behaviors. We examine how the use of one ICT intervention—specifically, eHealth kiosks disseminating authenticated and accessible medical information—can alleviate the problem of high infant mortality in rural India. We investigate how mothers' social networks affect their use of eHealth kiosks, seeking professional medical care for their infants and, ultimately, infant mortality. Drawing on the social epidemiology and social networks literatures, we focus on advice and hindrance from both strong and weak ties as the conduit of social influence on mothers' health-related behaviors for the care of their infants. Over a period of 7 years, we studied 4,620 infants across 10 villages where the eHealth kiosks were imple-



SPECIAL ISSUE: IS & ENVIRONMENTAL SUSTAINABILITY

### SENSEMAKING AND SUSTAINABLE PRACTICING: FUNCTIONAL AFFORDANCES OF INFORMATION SYSTEMS IN GREEN TRANSFORMATIONS<sup>1</sup>

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This paper explores how a world-wide operating software solutions provider implemented environmentally sustainable business practices in response to emerging environmental concerns. Through an interpretive case study, we develop a theoretical framework that identifies four important functional affordances originating in information systems, which are required in environmental sustainability transformations as they create an actionable context in which (1) organizations can engage in a sensemaking process related to understanding emerging environmental requirements, and (2) individuals can implement environmentally sustainable work

Seidel, S., Recker, J., & vom Brocke, J. (2013). Sensemaking and Sustainable Practicing Functional better understanding of IS-enabled Affordances of Information Systems in Green Transformations. MIS Quarterly, 37(4), 1275-1299.





### DIGITAL ACTION REPERTOIRES AND TRANSFORMING A SOCIAL MOVEMENT ORGANIZATION<sup>1</sup>

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An emerging research agenda focuses on social media's influence on political activism. Specific attention has recently been paid to digital social movement organizing and action repertoire development. The literature acknowledges the changing face of activism at the movement level, but little is known about the relationship between social movement organizations (SMOs) and digital action repertoires. Understanding this relationship is critical because strong adherence to values is at the heart of establishing action repertoires with legitimacy and persistence. In this paper, we rely on a two-year longitudinal study of the Swedish affiliate of Amnesty International. We examine the transformation in engagement and interaction that followed the organization's introduction of new action repertoires. Drawing on resource mobilization theory and the collective action space model, we elaborate how new action repertoires both stabilized and challenged the values of the SMO, as well as gradually broadened the interactions of supporters and deepened their modes of engagement. We offer a value-based model on the antecedents and effects of new action repertoires from the SMO perspective. The empirical findings and the model build new theory on social media and digital activism at the organizational level, complementing the predominant movement level research in the extant literature.

Keywords: Collaboration, organization, societal change, case study, networks and communities, digital activism

> There may be times when we are powerless to prevent injustice, but there must never be a time when we fail to protest.

> > - Elie Wiesel, Winner of the Nobel Peace Prize, 1986

#### Introduction

accepting senior editors for this paper.

means of action to mobilize support, or movement, against prevailing social and political injustices (Bennett and Segerberg 2011; Gil de Zuniga et al. 2012; Oh et al. 2013; Pu and Scanland 2012; Tufekci and Wilson 2012; Valenzuela 2013). These digital mechanisms reduce the effort and resources

Selander, L., & Jarvenpaa, S. L. (2016). Digital Action Repertoires and Transforming a Social Movement Organization. MIS Quarterly, 40(2), 331-352.









BIG DATA & ANALYTICS IN NETWORKED BUSINESS

### COMPETITIVE BENCHMARKING: AN IS RESEARCH APPROACH TO ADDRESS WICKED PROBLEMS WITH BIG DATA AND ANALYTICS<sup>1</sup>

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Wicked problems like sustainable energy and financial market stability are societal challenges that arise from complex sociotoechnical systems in which numerous social, economic, political, and technical factors interact. Understanding and mitigating these problems requires research methods that scale beyond the traditional areas of inquity of information systems (IS) individuals, organizations, and markets and that deliver solutions in addition to insights. We describe an approach to address these challenges through competitive benchmarking (CB), a novel research method that helps interdisciplinary research communities tackle complex challenges of societal scale by using different types of data from a variety of sources such as usage data from customers, production patterns from producers, public policy and regulatory constraints, etc. for a given instantiation. Further, the CB platform generates data that can be used to improve operational strategies and judge the effectiveness of regulatory regimes and policies. We describe our experience applying CB to the sustainable energy challenge in the Power Trading Agent Competition (Power TAC) in which more than a docen research groups from around the world jointly devise, benchmark, and improve IS-based solutions.

Keywords: Benchmarking, big data analytics, design science, energy information systems, research competitions, smart grids, sustainability, virtual worlds

Introduction

https://www.youtube.com/watch?v=jVpglyzZyf8

# What do you need to do when you pursue research in your studies?

 Demonstrate your ability to conduct research and scholarship that make a unique contribution and meet the standards of credibility and verifiability

Example: PhD

"The Doctor of Philosophy degree is awarded in recognition of a student's erudition in a broad field of learning and for notable accomplishment in that field through an **original and substantial contribution to [the body of] knowledge**."

From the QUT Doctor of Philosophy Regulations (IF49)

- Common misleading views on what research is about:
  - The great idea

"I have just had this great idea! I do not know if anyone else has ever had the same idea, because I've not checked, and I'm rather new in this field. Anyway, my idea is brilliant, so I really would like to share it with you all."

- Common misleading views on what research is about:
  - Other people's idea

"I have just read this great book that I really like a lot. I'll just give you a short resume of the interesting points in the book and apply it to this situation over here."

- Common misleading views on what research is about:
  - The software hacker

"I have just built this great computer system/software tool/mobile application. It is not based on previous theories or empirical findings. I am not very theoretical myself, but the system has a lot of fantastic features, and the interface is neat. Plus, people could really use it."

- Common misleading views on what research is about:
  - The theory hacker

"I have come up with this theory/conceptual framework/model/methodology. It is not related to other theories/conceptual frameworks/models, or any empirical data for that matter. Most of the concepts have been defined differently by all the big shots in the field, but I just do not like their categories so I have invented my own. And I think it is surely better (I haven't checked that either)."

### What matters to research?

### Ambition

- The ambition to complete a doctoral degree to enter (or progress) an academic career is different from the ambition to pursue a research degree as recognition of thought leadership for industry or corporate careers.
- What is your ambition?

### Dedication

- The enthusiasm that you need to work on a novel and intrinsically complex challenge for a substantial amount of time
- Are you dedicated?

### Commitment

- The willingness to free time and resources to work dedicatedly on the research
- Are you free to commit yourself?

# Research is a challenging task

- Fewer than 65 percent of people who start PhD programs finish them (Bowen, W. and N. Rudenstine. 1992). More recent data paints a similar picture: Attrition in residential doctoral programs is as high as 50 percent in face-to-face programs (de Vise, 2010) and 50–70 percent in online programs (Rigler Jr. et al., 2017). In Germany, attrition rates are said to be about 15 percent of doctoral students in social science disciplines and about 25 percent in engineering disciplines (Franz, 2015).
- Ten percent of doctoral students claim to have considered suicide, and 54 percent of doctoral students have felt so depressed at various stages that they had difficulty functioning (OnlinePhDPrograms.Net).
- In one study, 43 percent of participating graduate students reported experiencing more stress than
  they could handle, with PhD students expressing the greatest stress. More than half listed stress or
  burnout as a major concern, about a quarter cited feeling like outsiders, and nearly a third listed their
  relationships withprofessors as a cause of stress (Patterson, 2016).

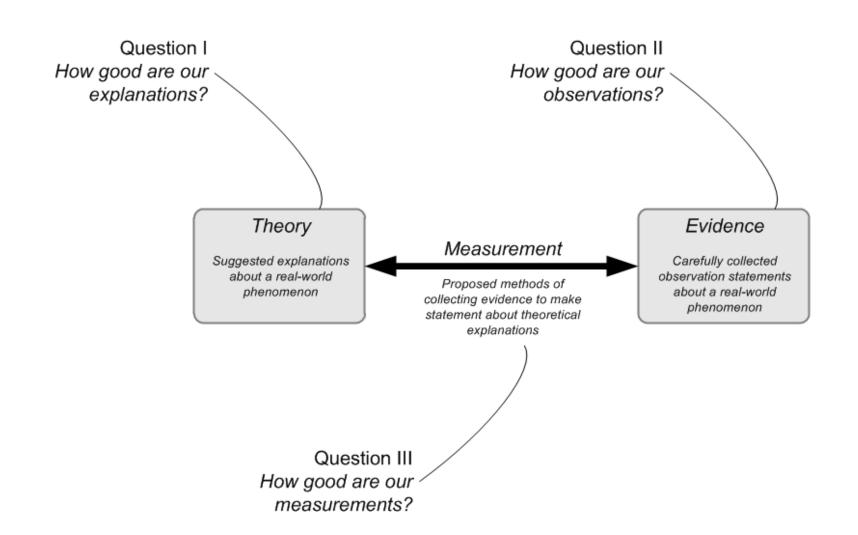
# Instead of taking in more knowledge, you have to create knowledge

- Most common reason is that students do not understand the formal cause of earning a research degree.
  - Elementary school is like learning to ride a tricycle.
  - High school is like learning to ride a bicycle.
  - College is like learning to drive a car.
  - A master's degree is like learning to drive a race car.
  - Students often think that the next step (a research degree) is more of the same, like learning to fly an airplane.
  - On the contrary, a research degree (like a PhD) is like learning to design a new car.

## How do you create new knowledge?

- The body of knowledge is the current accumulation of theories, evidence and methods in a certain domain (e.g. medicine, management, education etc).
- Typically consists of theories that have been evidenced i.e., not falsified (yet).
- Also consists of methods that have been used to evidence or falsify theories.
- Sometimes can be innovative and important new evidence.
- Is available in the scientific community in the form of paper, articles and books.

# What is the body ofknowledge?



# **Examples for IS research that address questions I, II or III**

## From my own work

### • Question 1:

Seidel, S., Recker, J., and vom Brocke, J. "Sensemaking and Sustainable Practicing: Functional Affordances of Information Systems in Green Transformations", MIS Quarterly (37:4) 2013, pp. 1275-1299.

#### • Question 2:

Recker, J. and Lekse, D. "A Field Study of Spatial Preferences in Enterprise Microblogging", Journal of Information Technology (31) 2016.

### • Question 3:

Schmiedel, T., vom Brocke, J., and Recker, J. "<u>Development and Validation of an Instrument to Measure Organizational Cultures' Support of Business Process Management</u>", *Information & Management (51:1) 2014, pp. 43-56.*

# **Example Question 2:**

Implementing Enterprise Social Networks at Woolworths Group



# Woolworths deploys 890 iPads for 'happier' store managers

**Summary:** The supermarket chain has given store managers across the country 3G-enabled iPads to reduce the time they have to spend doing tedious administration work in back offices.

By Spandas Lui | August 21, 2012 -- 02:11 GMT (12:11 AEST)

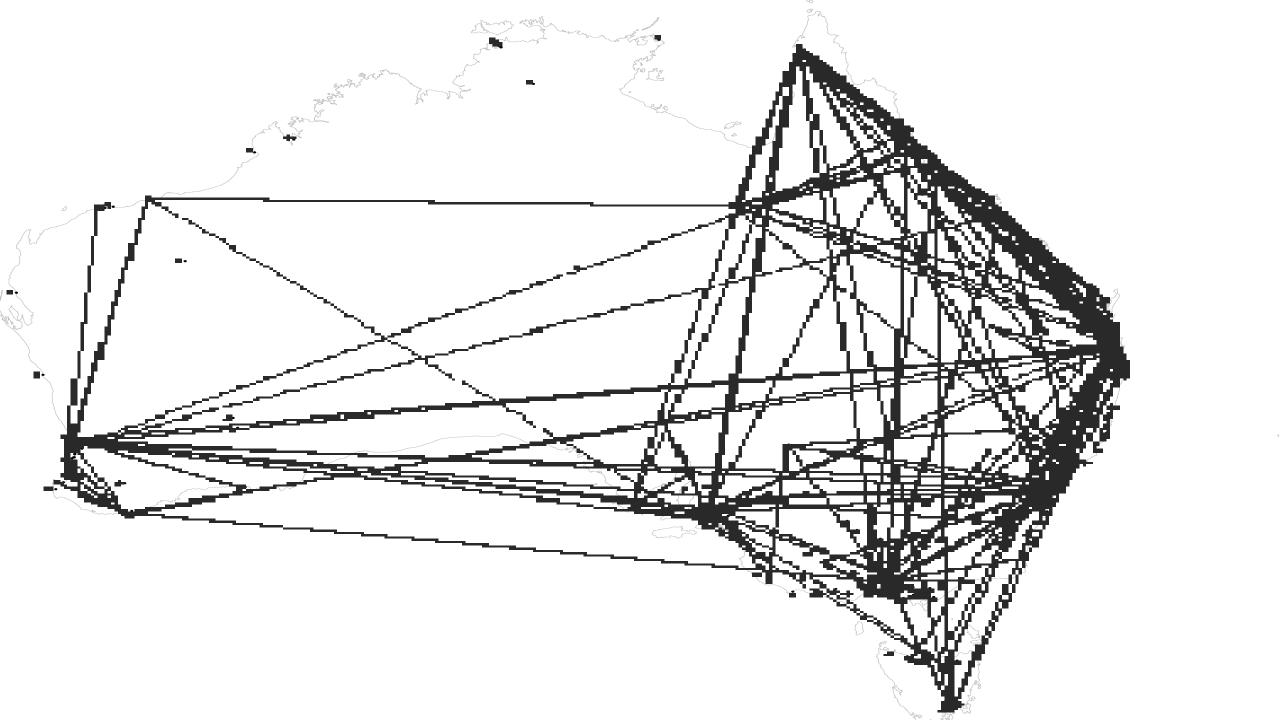
Supermarket giant Woolworths has rolled out Apple iPads to its 890 store managers across the country.

Woolworths ran an iPad pilot program with 90 area managers 12 months ago to resounding success, and last week decided to go ahead with a wider implementation program, as first reported by *The Australian* (

http://www.theaustralian.com.au/australian-it/it-business/ipads-to-save-woolies-millions/story-e6frganx-1226454418166).

One of the biggest time wasters for Woolworths store managers is administration tasks, such as back-end reporting and stock management. Previously, these were performed through desktops in back offices.

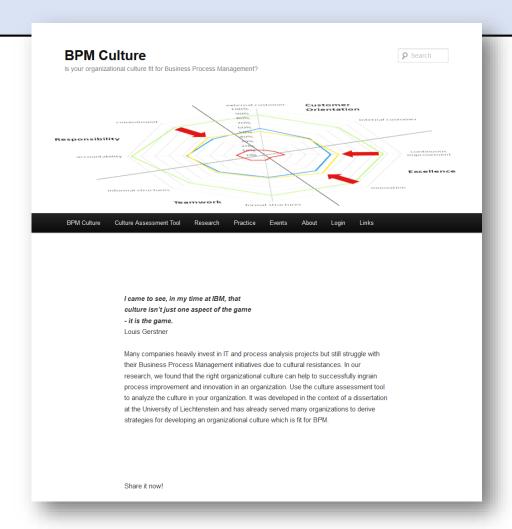
The third-generation 3G-enabled 16GB iPads, deployed on 17 August, have been filled with bespoke applications that allow store managers to do those tedious administration tasks as they roam around their store floor.



## **Example Question 3:**

http://www.bpm-culture.org

Can we measure whether an organization's culture is ready for Business Process Management?



Schmiedel, T., vom Brocke, J., & Recker, J. (2014). Development and Validation of an Instrument to Measure Organizational Cultures' Support of Business Process Management. *Information & Management*, 51(1), 43-56.

## **Example Question 3:**

- The following four cultural values and their subdimensions are critical to the success of BPM initiatives:
- Customer Orientation

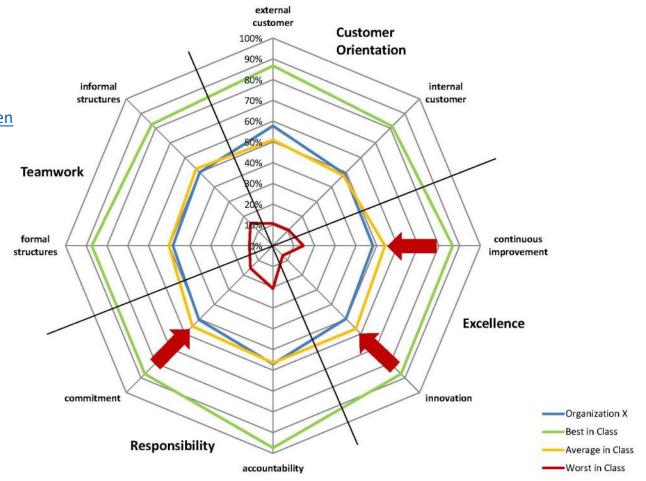
To what extent does the organization take the perspective of **external customers**? To what extent does the organization take the perspective of **internal customers**?

- Excellence
  - To what extent is the organization open for continuous process **improvement**? To what extent is the organization open for process **innovations**?
- Responsibility
  - To what extent does the organization foster **accountability** to process objectives? To what extent does the organization foster **commitment** to process objectives?
- Teamwork
  - To what extent do **formal structures** support cross-departmental teamwork? To what extent do **informal structures** support cross-departmental teamwork?

## **Example Question 3:**

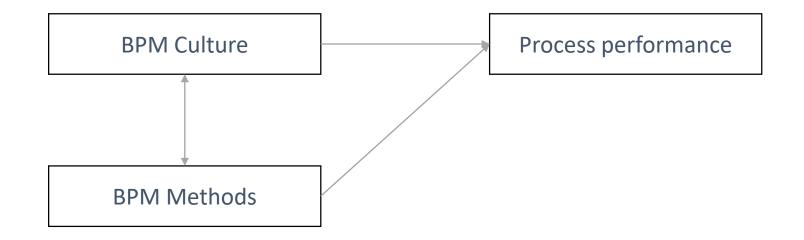
http://www.bpm-culture.org/limesurvey3/index.php/275895?newtest=Y&lang=en

- ✓ Hilti
- ✓ Ivoclar Vivadent
- ✓ Landesbank Berlin
- ✓ Lufthansa Technik
- ✓ Oerlikon Balzers
- ✓ Oerlikon Mechatronics
- ✓ ThyssenKrupp Presta

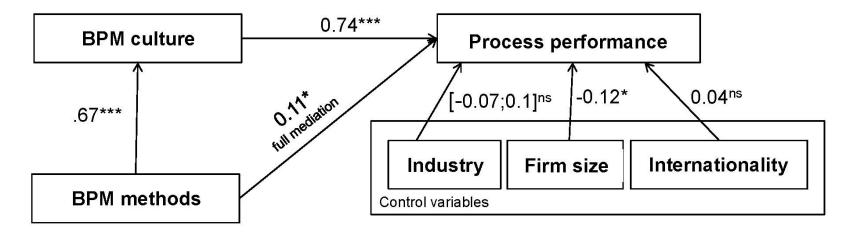


Schmiedel, T., vom Brocke, J., & Recker, J. (2014). Development and Validation of an Instrument to Measure Organizational Cultures' Support of Business Process Management. *Information & Management*, 51(1), 43-56.

## What one can do with better measures



## What one can do with better measures



\*\*\* p < 0.001; \* p < 0.05

# **End of Chapter 1**

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## Do you like podcasts?



http://www.janrecker.com/this-is-research-podcast/

### Season Two (starting August 2021)

- 1. Live at AMCIS 2021 (18 August 2021)
- 2. Managing Artificial Intelligence (1 September 2021)
- 3. When the Machine Meets the Expert (3 September 2021)
- 4. Coordinating Human and Machine Learning (5 September 2021)
- 5. Strategic Directions for AI (7 September 2021)
- 6. Will Humans-in-the-Loop Become Borgs? (9 September 2021)
- 7. Al on Drugs (11 September 2021)
- 8. Can Al be fair? (13 September 2021)
- 9. Is AI Ground Truth Really "True"? (15 September 2021)
- 10. <u>Theorizing about new technology? No problem! (29 September</u> 2021)

#### Season One (February-June 2021)

- 1. <u>Do we need theory for high-impact IS research? (9 February</u> 2021)
- 2. How ethical can we be? (11 February 2021)
- 3. Is all technology digital? (17 February 2021)
- 4. <u>Learning from Brad Greenwood about Econometrics of IS (3</u>
  <u>March 2021)</u>
- 5. Method-ism (17 March 2021)
- 6. When sociologists meet computer scientists (26 March 2021)
- 7. Who is reviewing the reviewers? (14 April 2021)
- 8. Careers on the line (28 April 2021)
- Every contribution can be interesting but not all of them are (12 May 2021)
- 10. From theorizing to imposter syndrome and back (26 May 2021)
- 11. Is relevance irrelevant? (9 June 2021)
- 12. <u>Have you considered the Technology Acceptance Model? (23</u> June 2021)