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From Scientific Process Management to Process Science: Towards an empirical research agenda for Business Process Management

Jan Mendling

Your take-aways

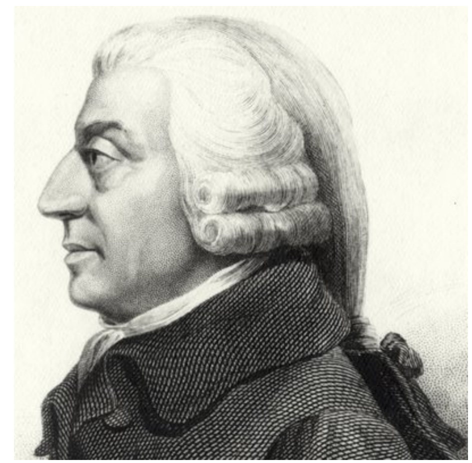
1. BPM requires a stronger grounding in the scientific method
2. BPM requires a broader uptake of experiments
3. Resulting insights will build the foundations of
   - Process science in research and the
   - Scientific process management in practice

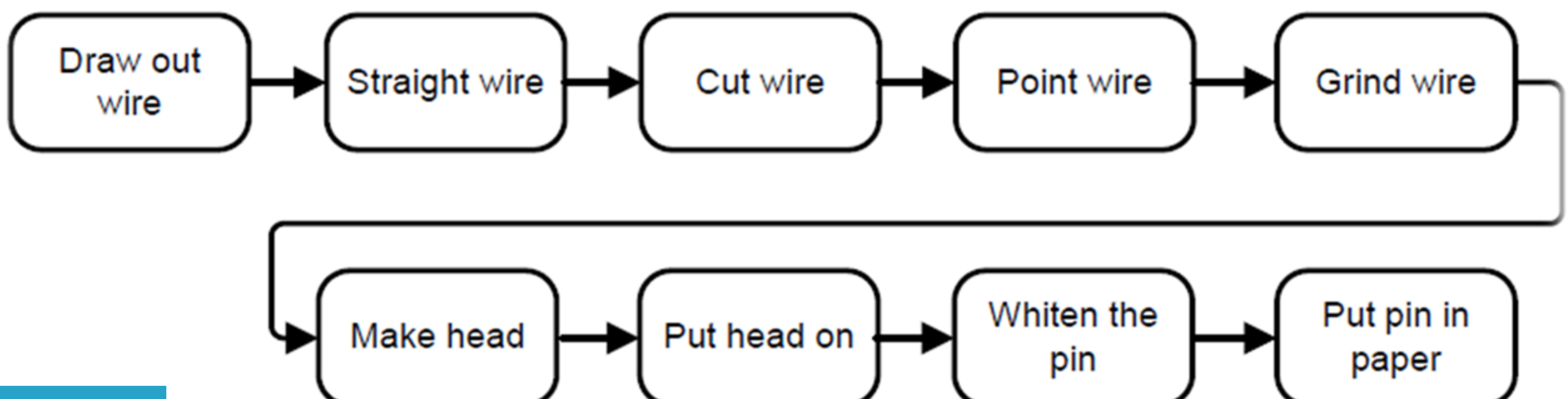
Business Processes

"To take an example, the trade of a pin-maker: But in the way in which this business is now carried on, it is divided into a number of branches:

- One man draws out the wire; another straights it;
- a third cuts it; a fourth points it; a fifth grinds it at the
- top for receiving the head; to make the head requires
- three operations; to put it on is a peculiar business;
- to whiten the pins is another; to put them into the paper;

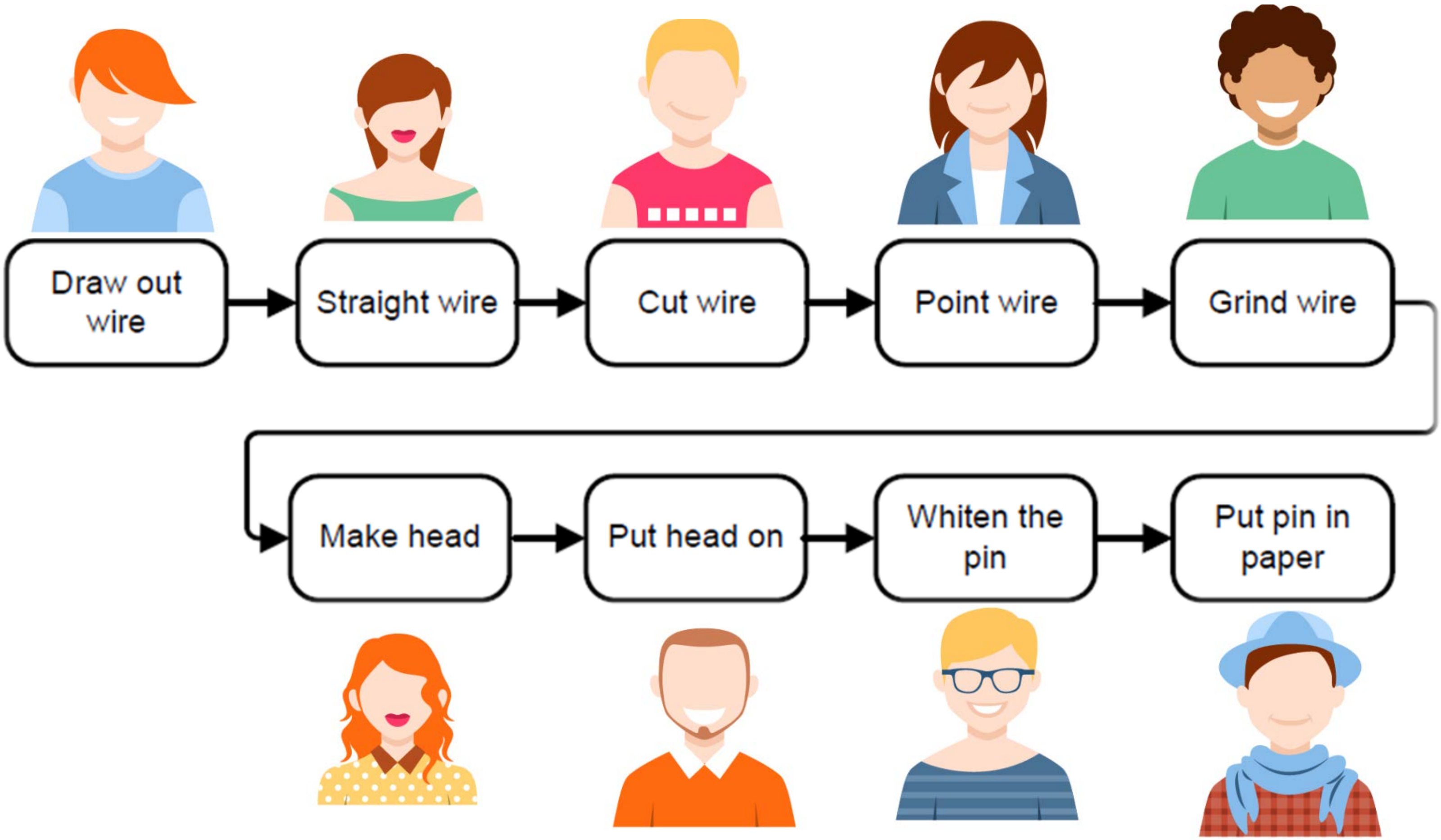
and the important business of making a pin is, in this manner, divided into about eighteen distinct operations."





Smith 1776

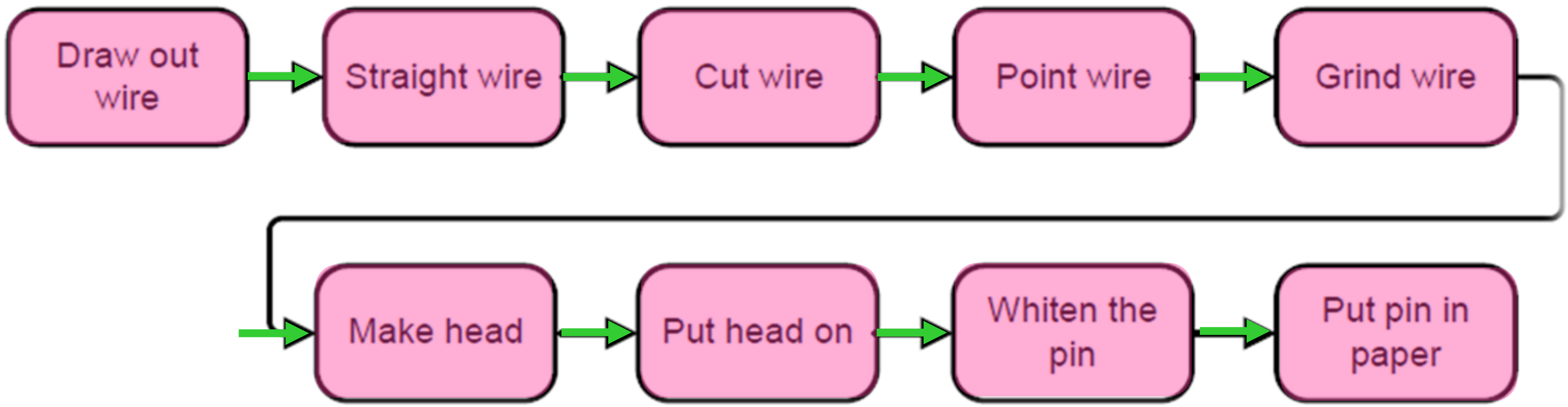
Division of Labour



Icons designed by Freepik

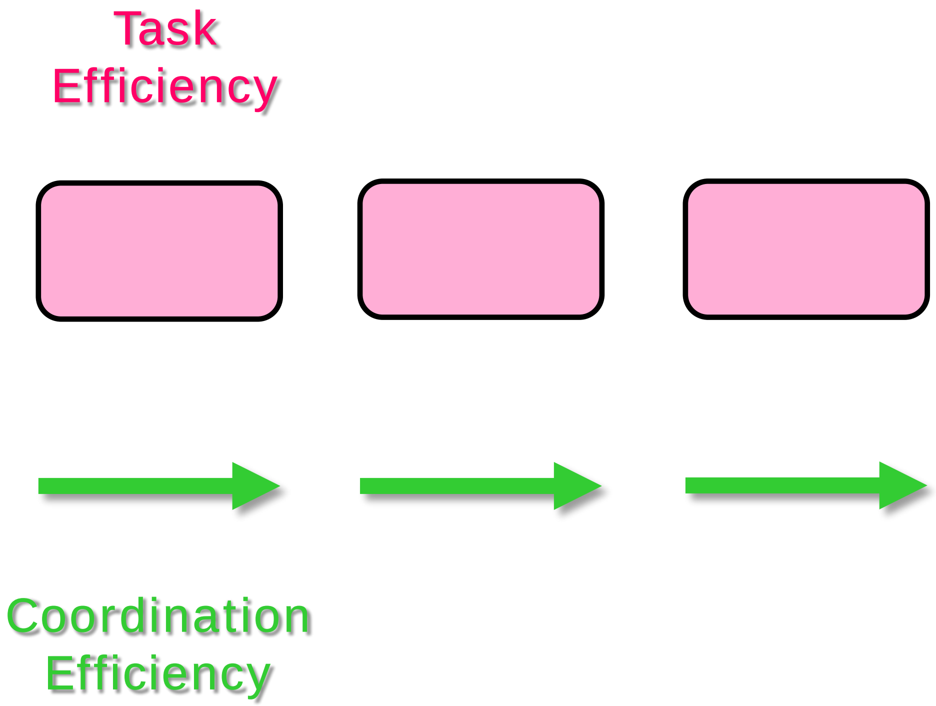
Task and Coordination Efficiency

Task Efficiency



Coordination Efficiency

What is more important?



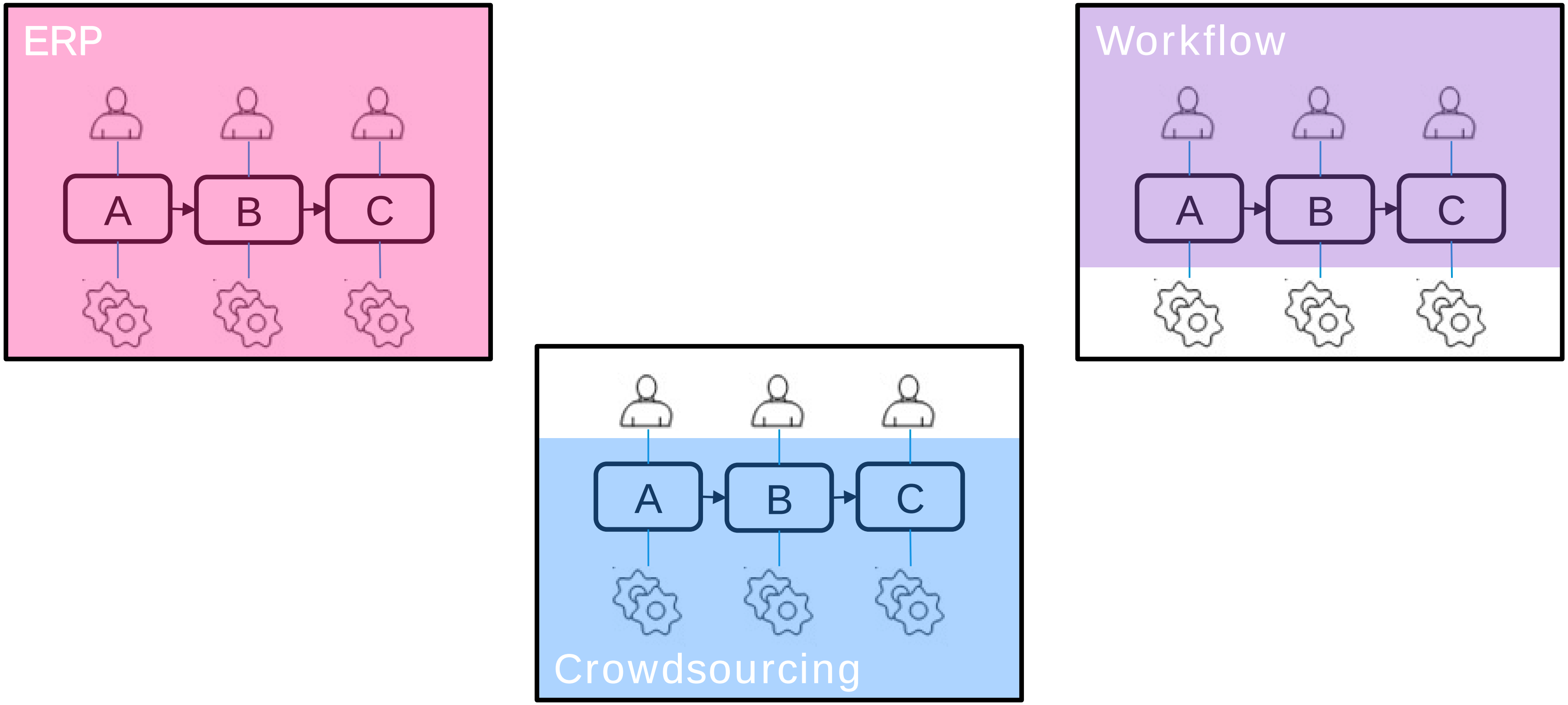
Flow-Time Efficiency of Business Processes in Practice

Minimal Working Time / (Working Time + Waiting Time)

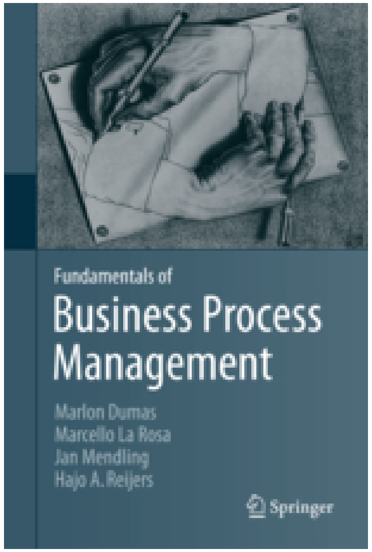
- Auto manufacturing 5.60%
- Hospital 3.75%
- Commercial bank 2.36%
- Consumer packaging 0.14%
- Life insurance 0.16%

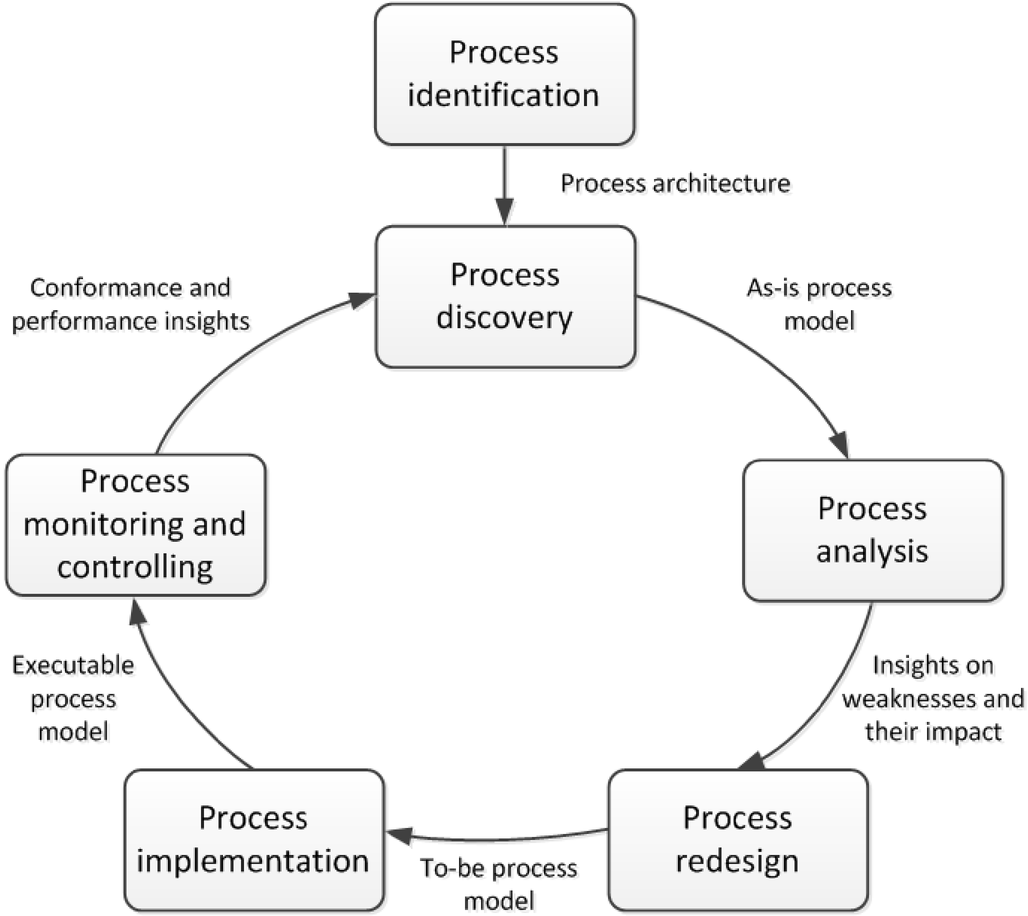
Blackburn 1992

Processes, People and Systems



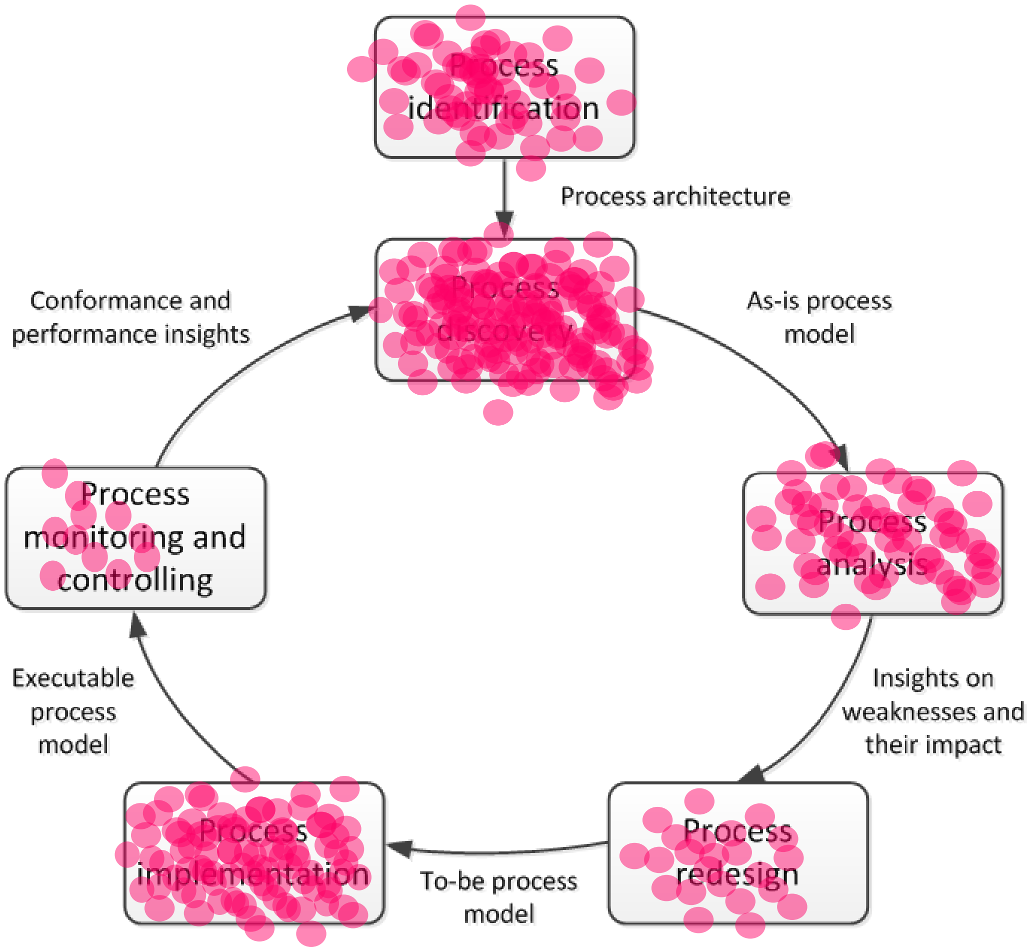
BPM Lifecycle





Dumas et al. 2013

Papers at BPM Conference



Research Components

Year	Artifact	Formal Concepts	Algorithm	Theory	Hypothesis	Ind. Variables	Dep. Variables
2003	15	12	1	8			
2004	18	11		5			
2005	35	16	9	5	1	1	1
2006	33	16	11	5			
2007	27	12	3	6	3	4	3
2008	23	6	5	5	2	1	1
2009	17	8	9	3	1	1	1
2010	20	6	5	3	1	1	1
2011	23	7	8	6			
2012	21	2	5	6			
2013	14	5	8	7			
Total	246	101	64	59	8	8	7

Findings on State of the Field

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Formal Science

B P M 2014 Haifa, Israel

Formal Science well established and well understood

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Findings on State of the Field

- **Make more use of established empirical methods including experiments, surveys and**
- **Put more emphasis on theory building**
- **Use more systematic literature reviews**

Empirical Science

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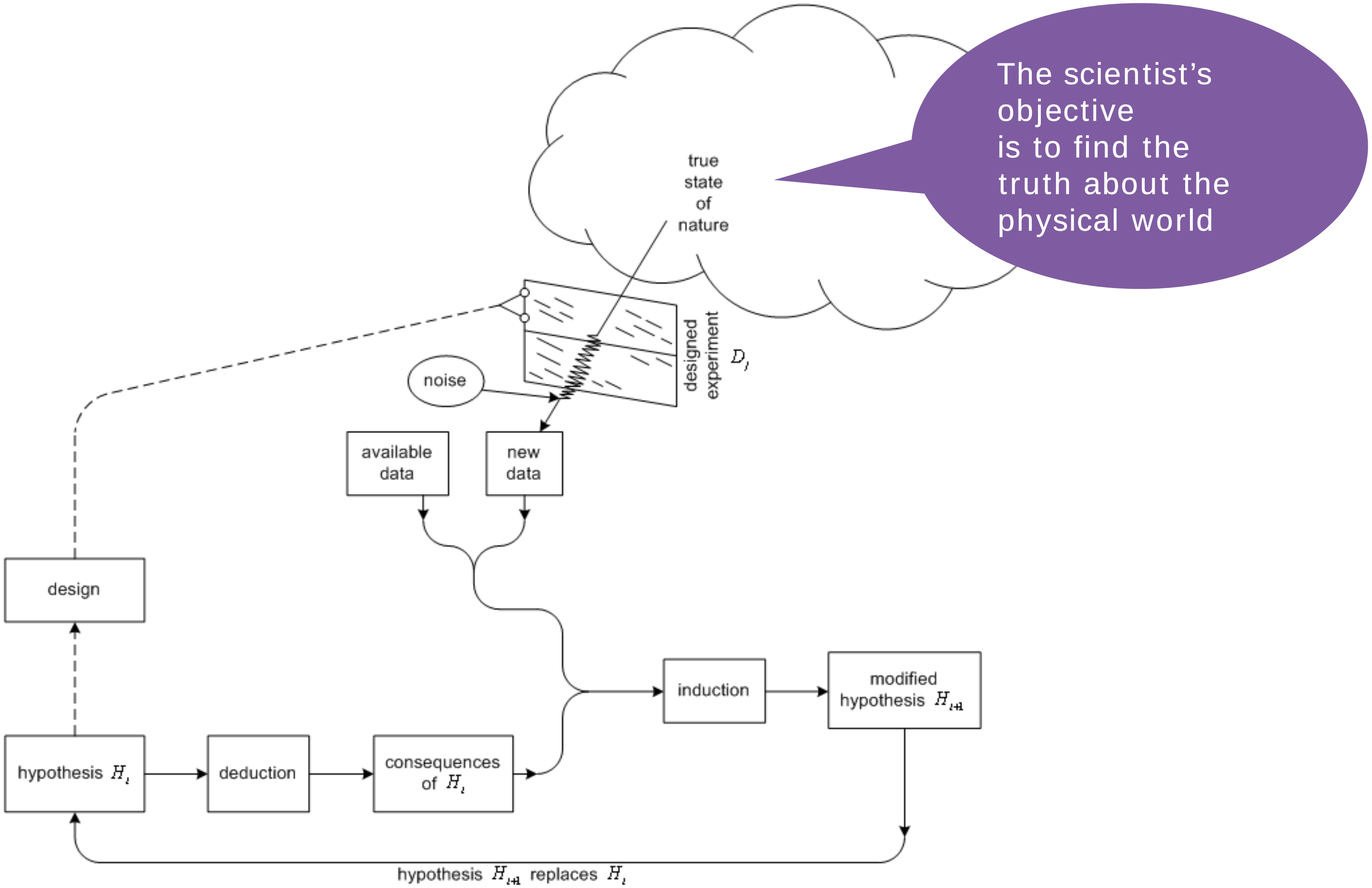
Findings on State of the Field

- Consider Methods like Action Research and Case Studies
- Evaluate with Design Hypotheses and Benchmark Data
- Adopt algorithm engineering

Design Science

Scientific Method Revisited

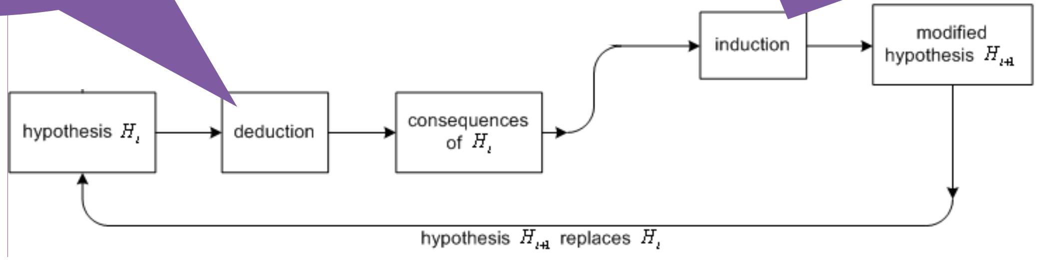


Box et al. 1978; Gauch 2003

Research Process

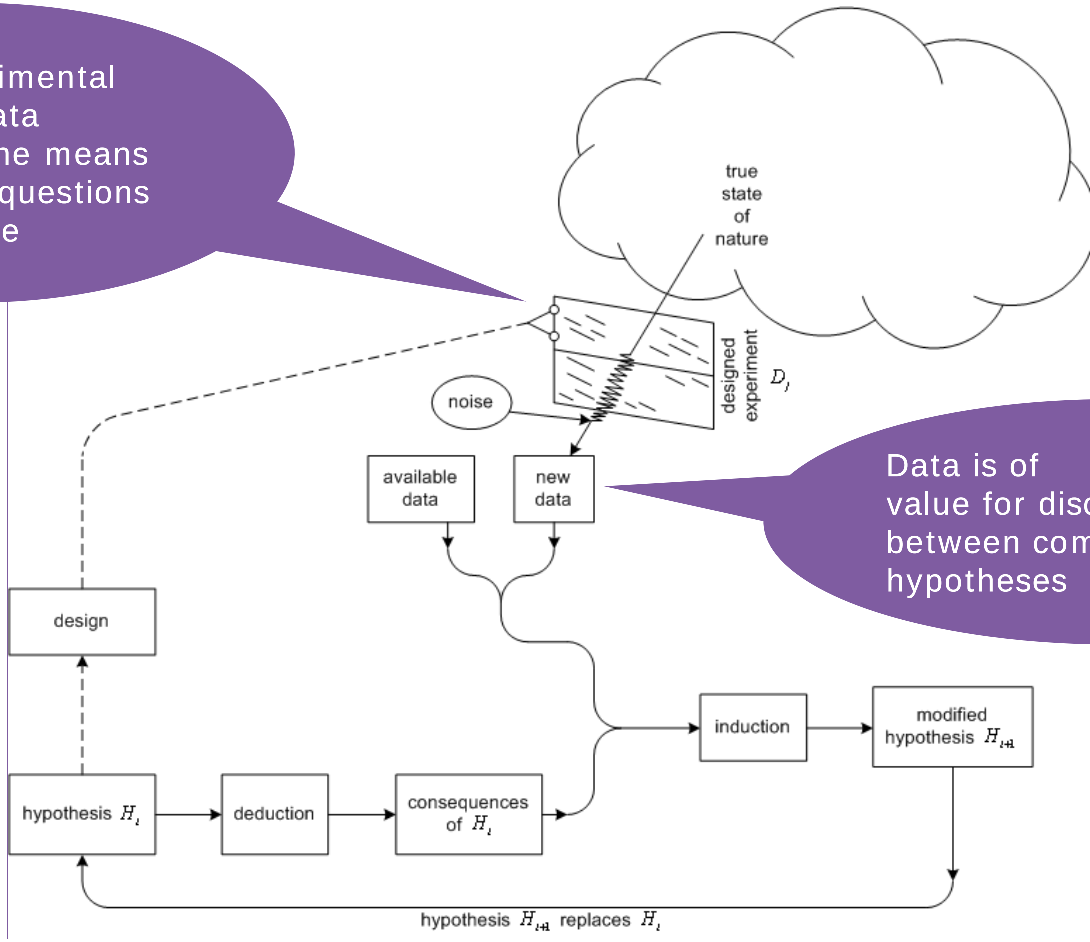
Deductive logic can be used to derive at the consequences or predictions of competing hypotheses

Inductive logic can be used to compare the various hypotheses' predictions against the data to determine which hypothesis is true or most likely to be true



Scientific Method Revisited

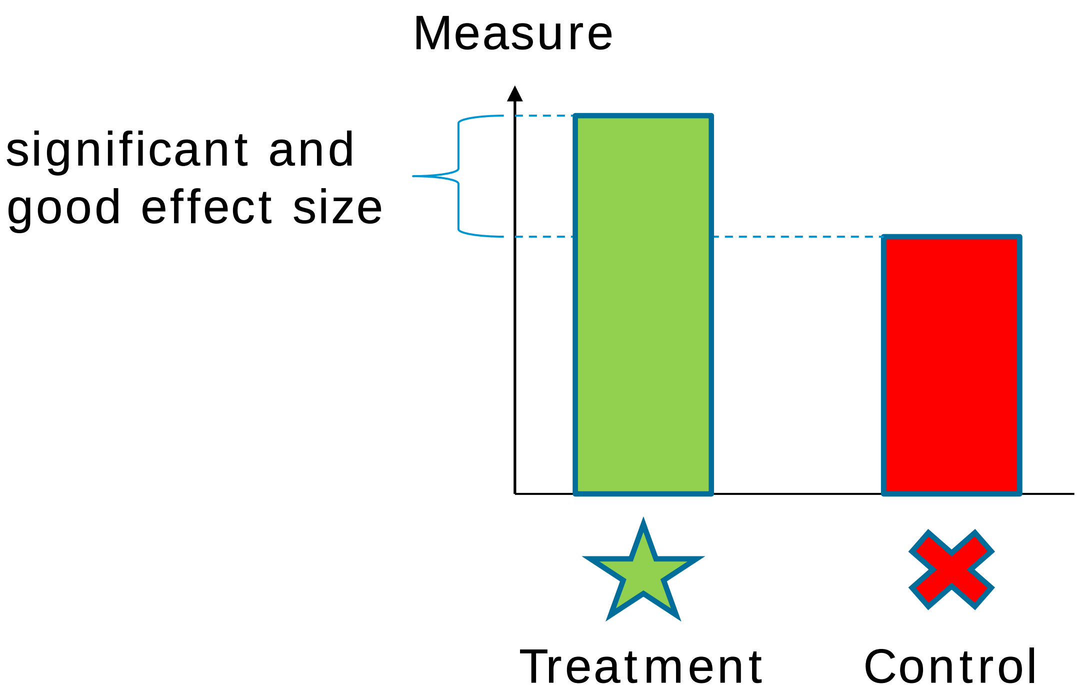
Efficient experimental designs and data analyses are the means for answering questions posed to nature



Data is of value for discriminating between competing hypotheses

Where is causality in BPM?

1. What is a desirable outcome?
2. What is a potentially strong factor?



Process Modeling Experiments

Subjects

Theory

Model

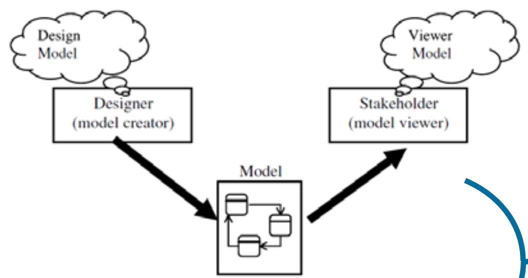


Fig. 2 Norman's [28] theory of action as applied to IS modeling

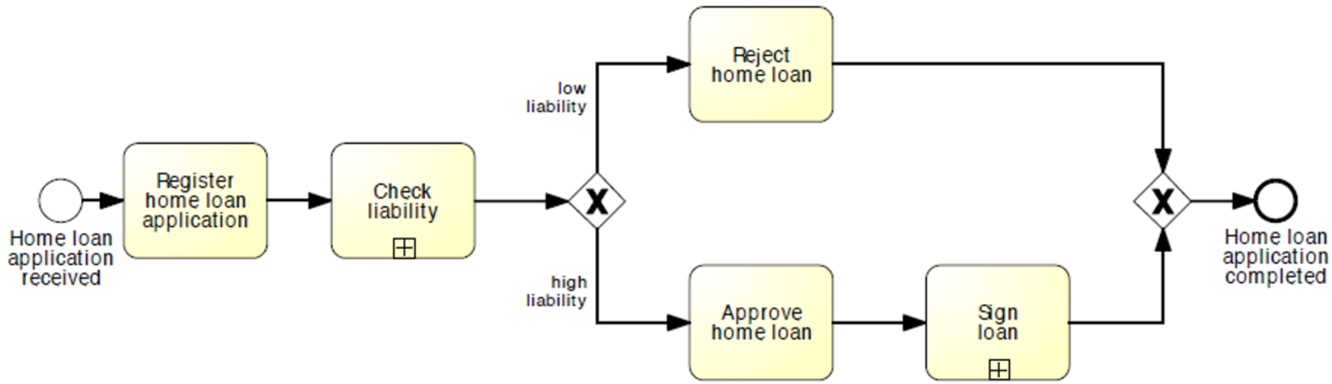
Task -> Outcome

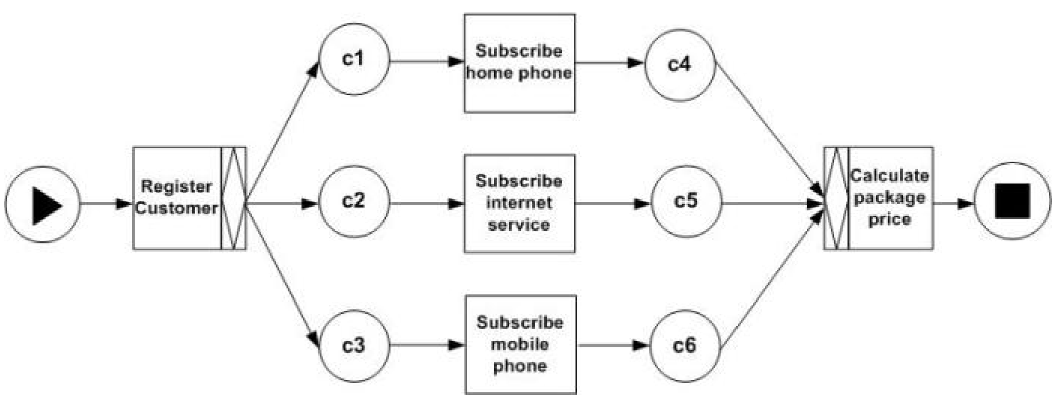
Technique

Observation

Independent variables (factors with treatment) -> dependent variables (response variables)

Is BPMN better than YAWL?





How to check if BPMN is better?

Subjects

Model

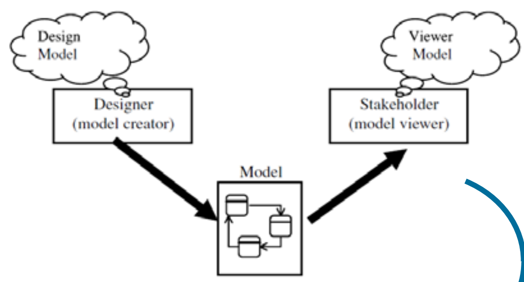
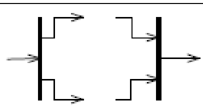
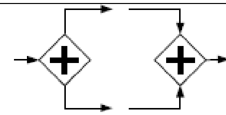
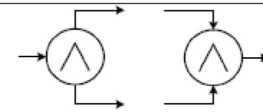
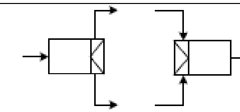
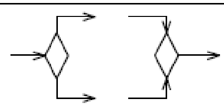
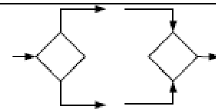
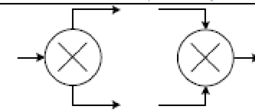
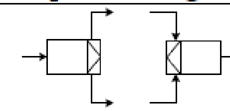
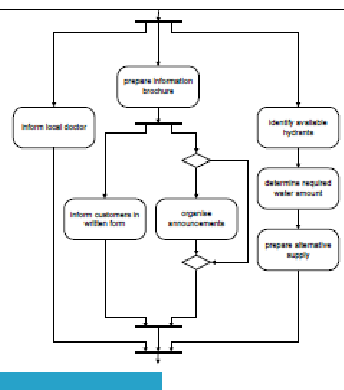
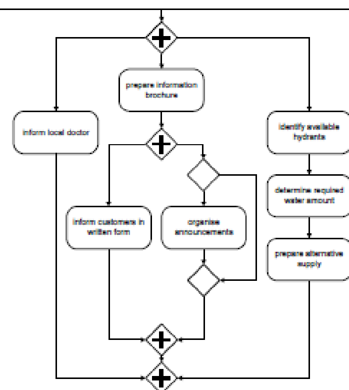
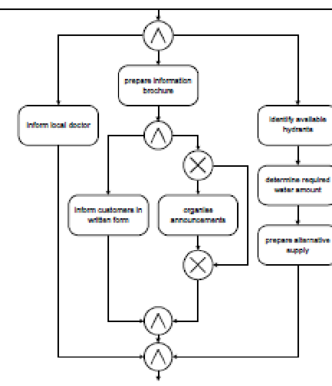
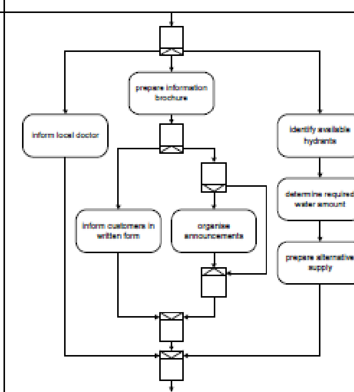


Fig. 2 Norman's [28] theory of action as applied to IS modeling

Task -> Outcome

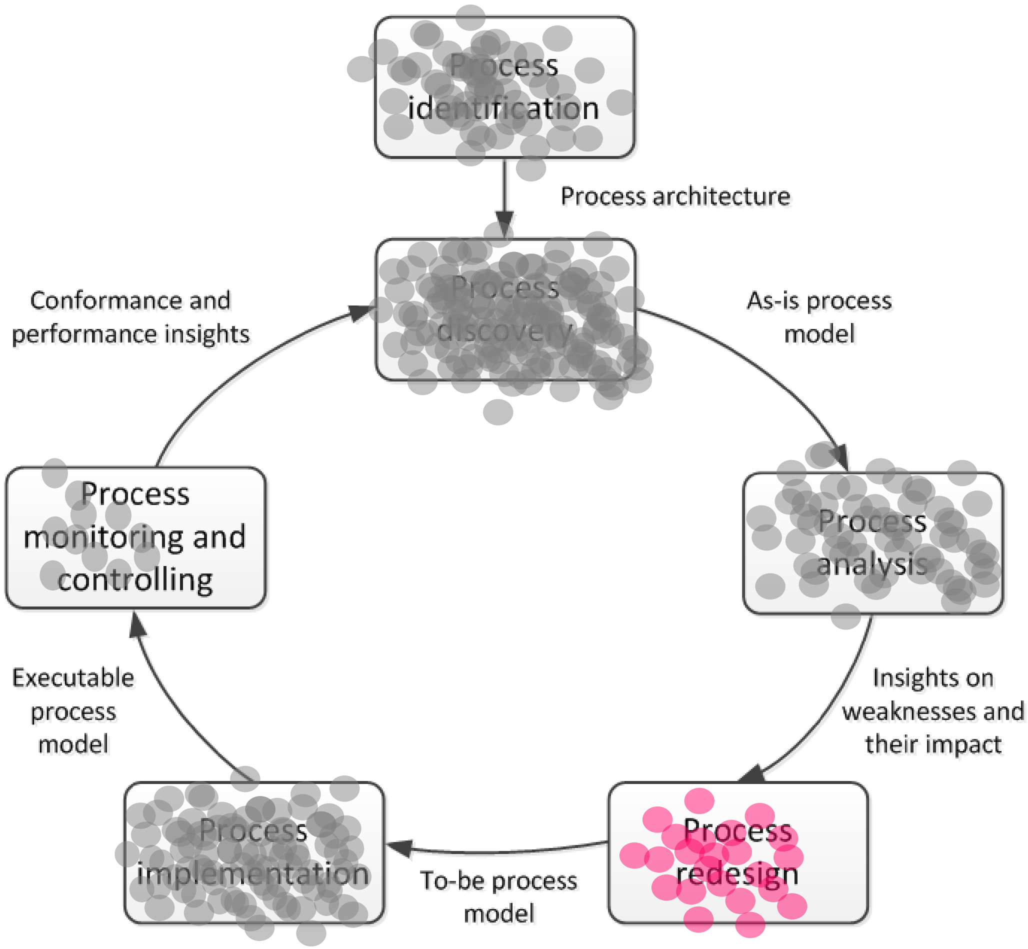
Technique

Symbol Set is the Factor

	R_{UML}	R_{BPMN}	R_{EPC}	R_{YAWL}
AND				
Outer Shape	*narrow rectangle (bar)*	*symmetric diamond-shape*	*circle*	*rectangle*
Inner Shape		*internal marker ("+")*	*logical marker for 'and' ("^")*	*left- and right-sided open triangle*
XOR				
Outer Shape	*diamond-shape without internal marker*	*symmetric diamond-shape*	*circle*	*rectangle*
Inner Shape		*-*	*"X" marker*	*triangle*
				

Figl et al, DSS 2013

Need to understand redesign



Scientific Management

Basic principles

1. Scientifically analyse and define each element of work
2. Train and teach workers according to the identified rules
3. Assure that work is conducted according to the rules
4. Divide work equally such that management is responsible for planning and worker for performing

Taylor 1911

Scientific Management

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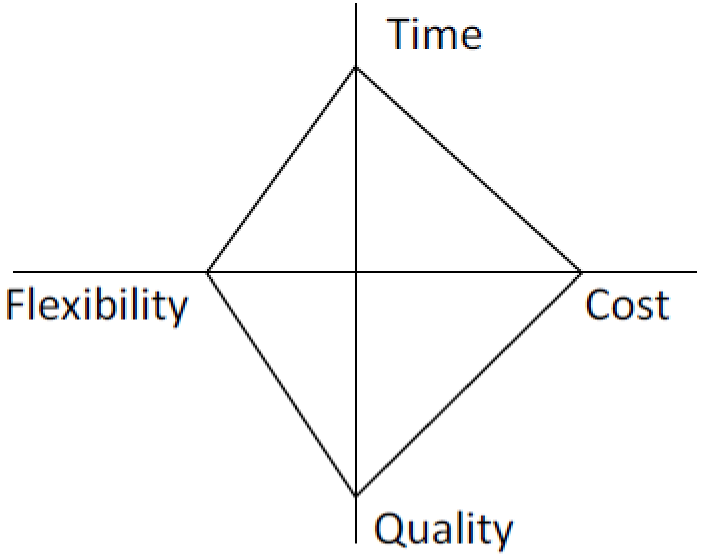
Task Efficiency

Shortcomings

- Less emphasis on the coordination of activities, but on their isolated analysis
- No development of a theory of process improvement

Taylor 1911

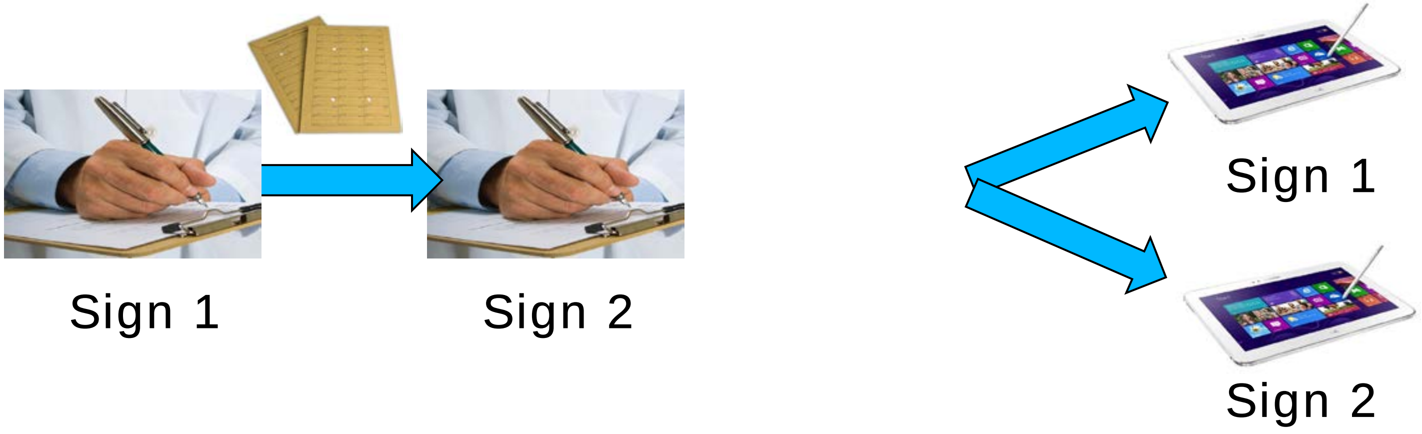
How we do redesign



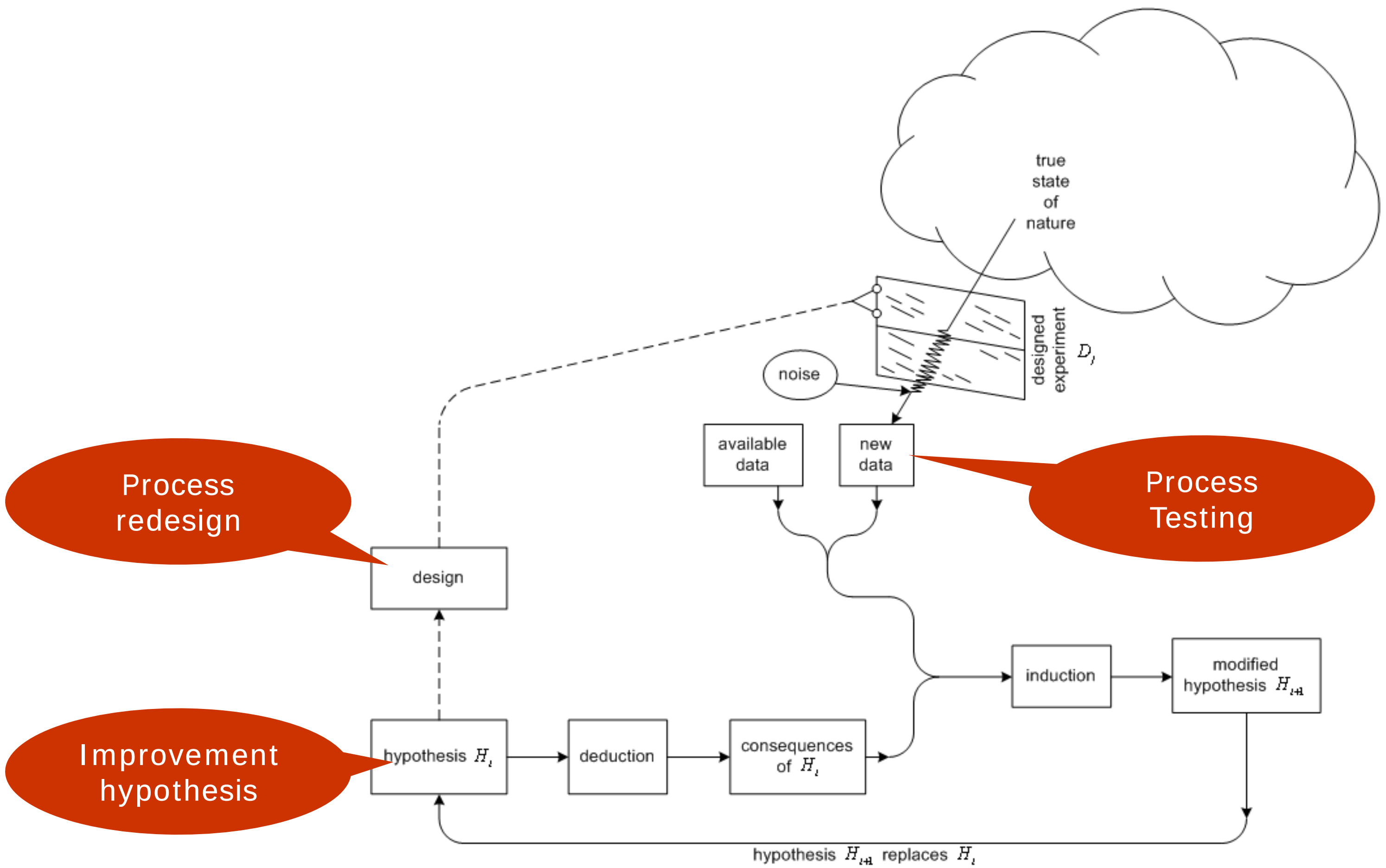
- Customer Heuristics
- Operations Heuristics
- Behaviour Heuristics
- Organization Structure Heuristics
- Organization Population Heuristics
- Information & Technology Heuristics
- Environment Heuristics

Redesign Heuristics: Behaviour Example

- Parallelism:
  "Consider whether activities may be executed in parallel"



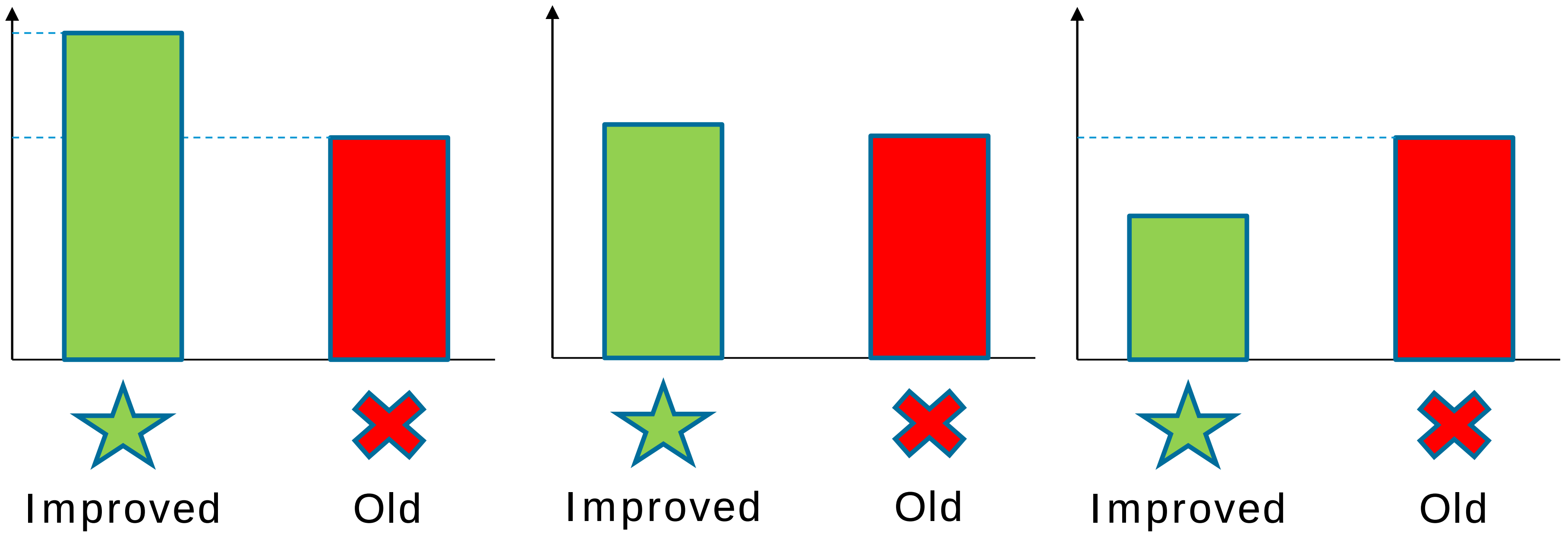
How we should do redesign



Weber/Mendling, 2015

“Improved“ credit application

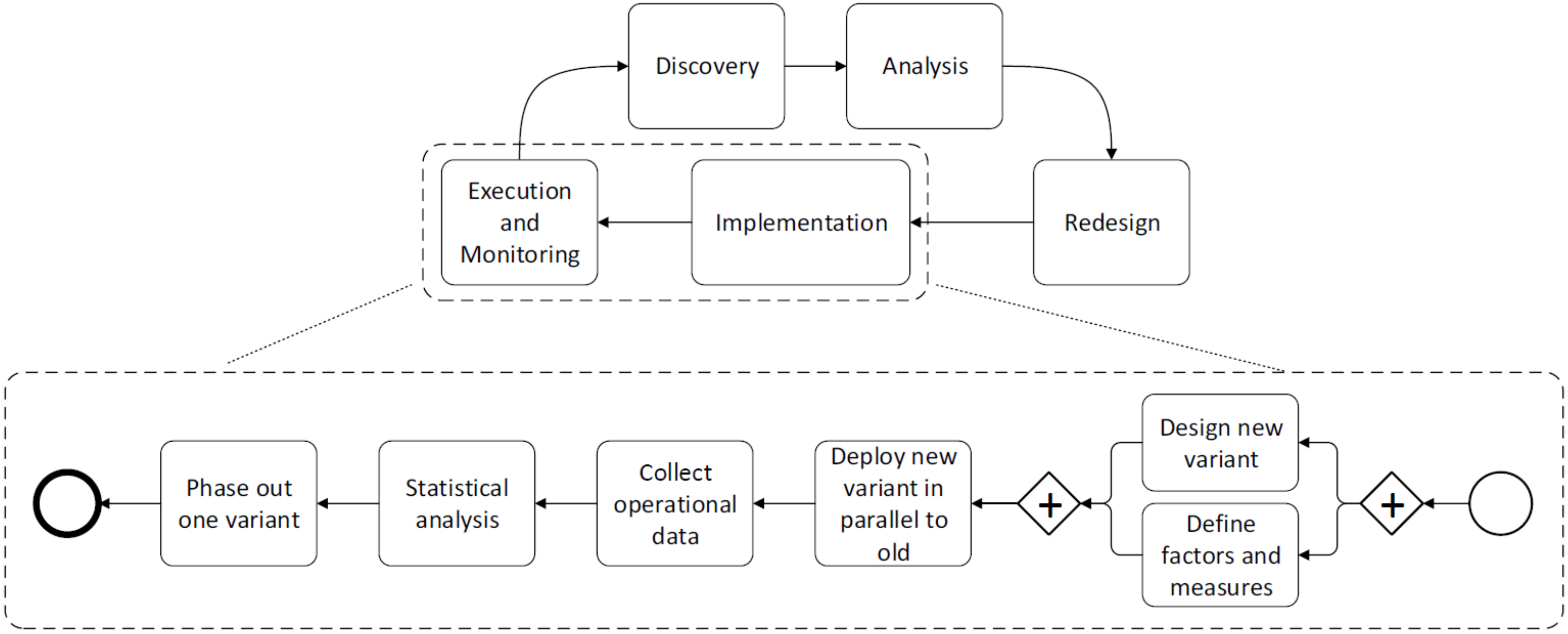
Improving Microsoft's Help Website with A/B Testing



~ 33% ~ 33% ~ 33%

Kohavi, 2009

How to integrate this into BPMS



Implications for Research: Process Science

We need to understand:

- Factors that make a process better
- Measures of desirable outcomes
- Taxonomies for both
- Theories that explain effects
- Insights into effect sizes
- Concepts to implement systems accordingly

Implications for practice: Scientific Process Management

We need to provide:

- Systems for conducting process experiments
- Reusable best practice processes
- Analytics for identifying factors

Your take-aways

1. BPM requires a stronger grounding in the scientific method
2. BPM requires a broader uptake of experiments
3. Resulting insights will build the foundations of
   - Process science in research and the
   - Scientific process management in practice
4. Read more in http://link.springer.com/article/10.1007%2Fs12599-015-0411-3

References

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