Digitalization and BPM- A new look at business process management

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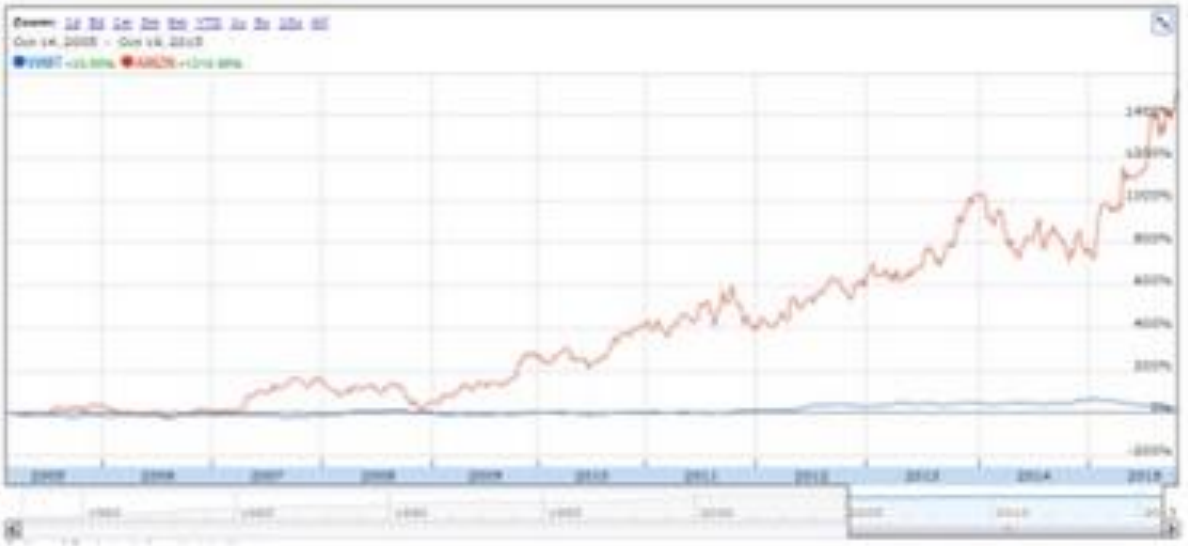
Value creation difference

WALMART VS AMAZON GROWTH OVER 10 YEARS: 12% VS 1516%



Logistics & supply chain squeezing have limits. External value add is much less limited.

Did
the process
Improvement
make
the
Difference?

Industrial difference

Clip slide

SOMETHING HAS CHANGED

FIRM	YEAR	EMPLOYEES	MKT CAP
BMW	1916	116,000	$53B
UBER	2009	7,000	$60B
MARRIOT	1927	200,000	$17B
AIRBNB	2008	5,000	$21B
WALT DISNEY	1923	185,000	$165B
FACEBOOK	2004	12,691	$315B
KODAK	1888	145,000	$30B (heyday)
INSTAGRAM	2010	13	$1B (acquisition)

How much does The Process Design Contribute to such change?

Digititalization

The process of encoding information and rules for manipulating information into digital form (digitizing) and its deep embedding this into organizational contexts

Digitizing work

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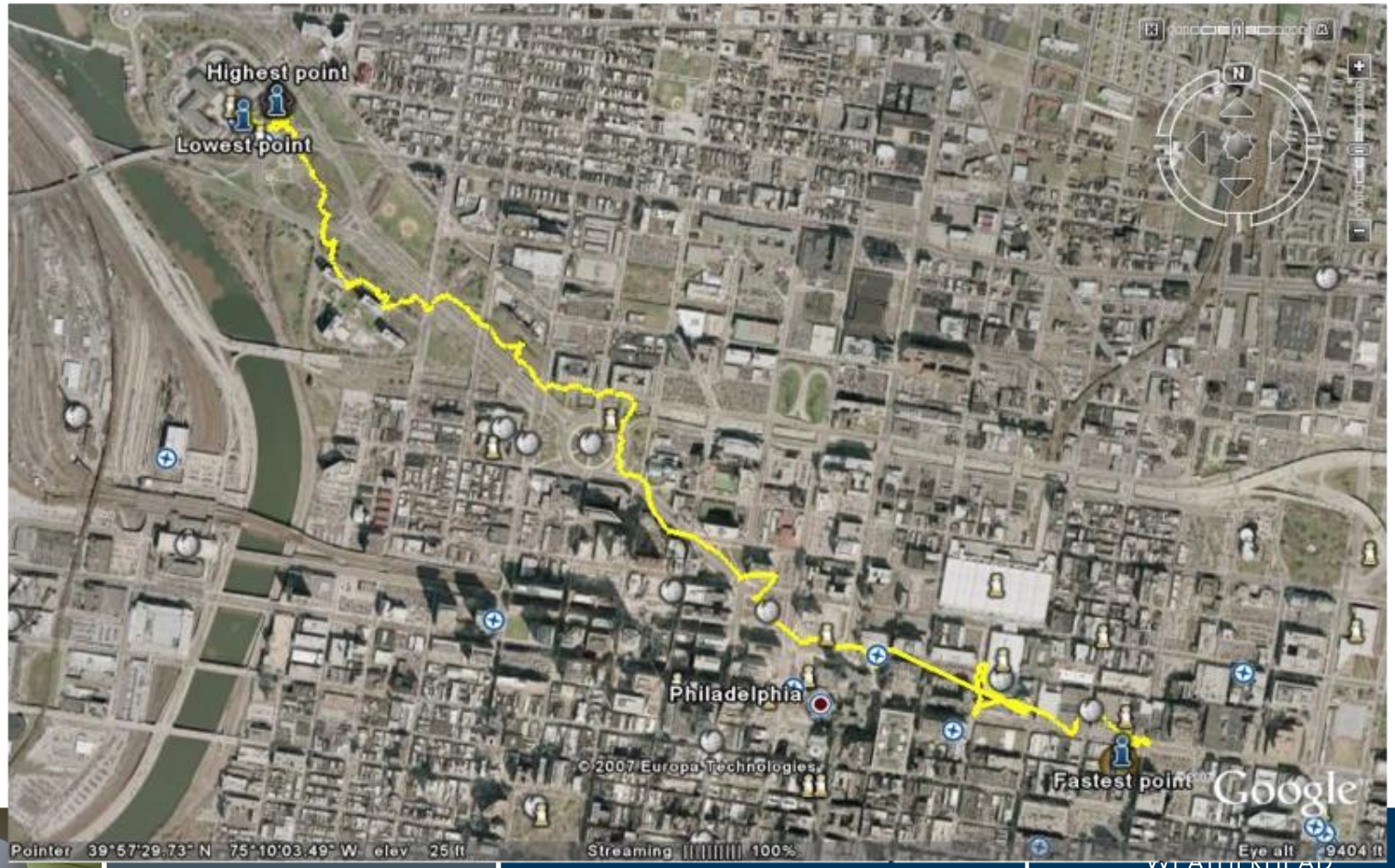
digitizing tools
and outcomes

digitizing time & space



Digitizing relationships

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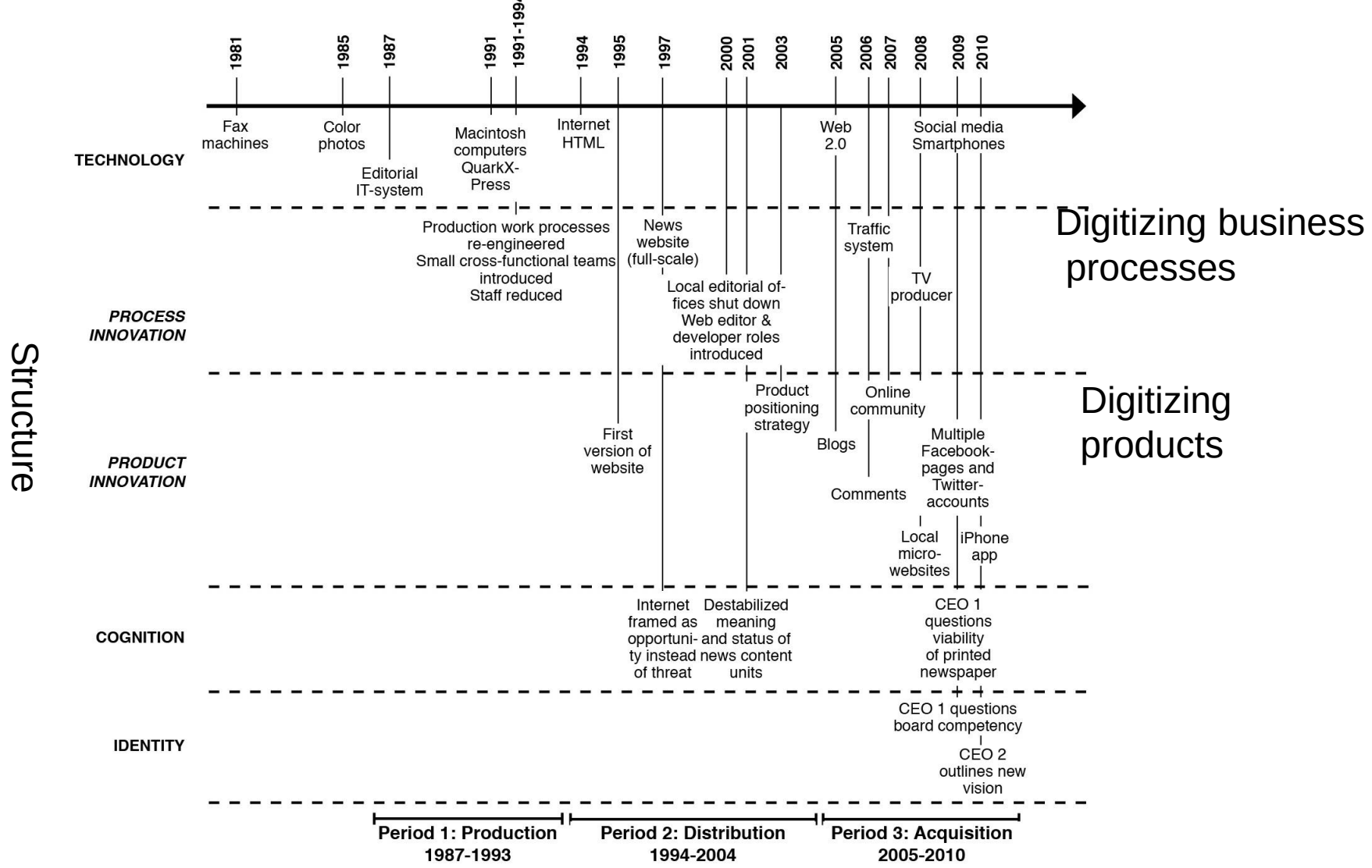
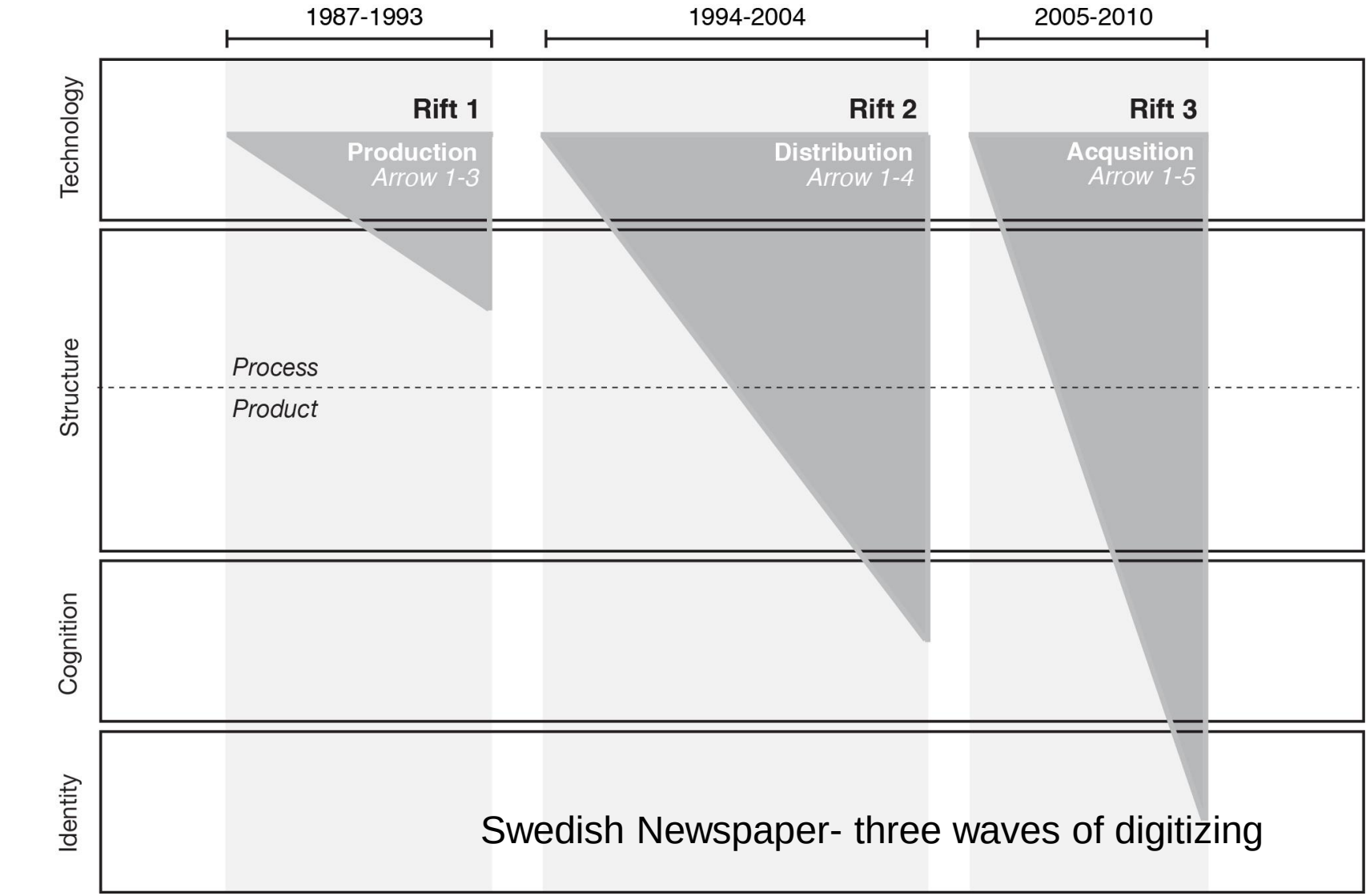
digitizing products

digitizing products as services



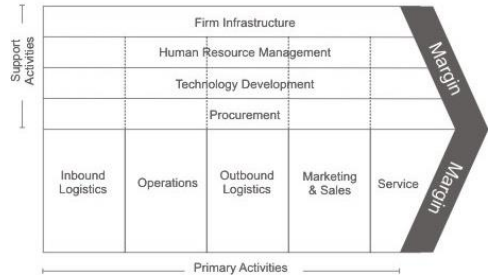
Leading Swedish Newspaper


1987-1993
1994-2004
2005-2010
Technology
Structure
Cognition
Identity
Rift 1
Production
Arrow 1-3
Rift 2
Distribution
Arrow 1-4
Rift 3
Acqusition
Arrow 1-5
Process
Product
Swedish Newspaper- three waves of digitizing

We are at turning point?

because of the shift in the locus of innovation and because some of our core organizing axioms may be challenged or fundamentally changed by the digital revolution, the *nature of innovation and organizational scholarship may be at a transition point* (Brenner and Tushman 2015 p. 2).

Classic Industrial Firm Value Model



purchase

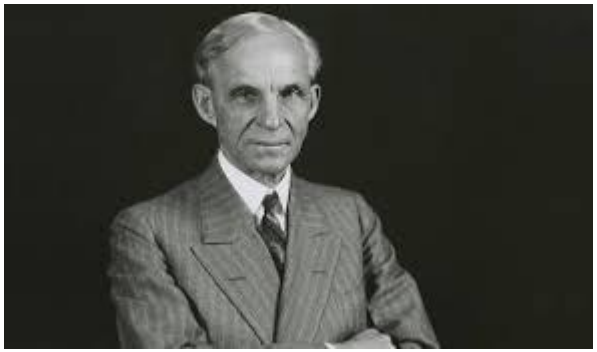
user

producer

Value Exchange as Transaction

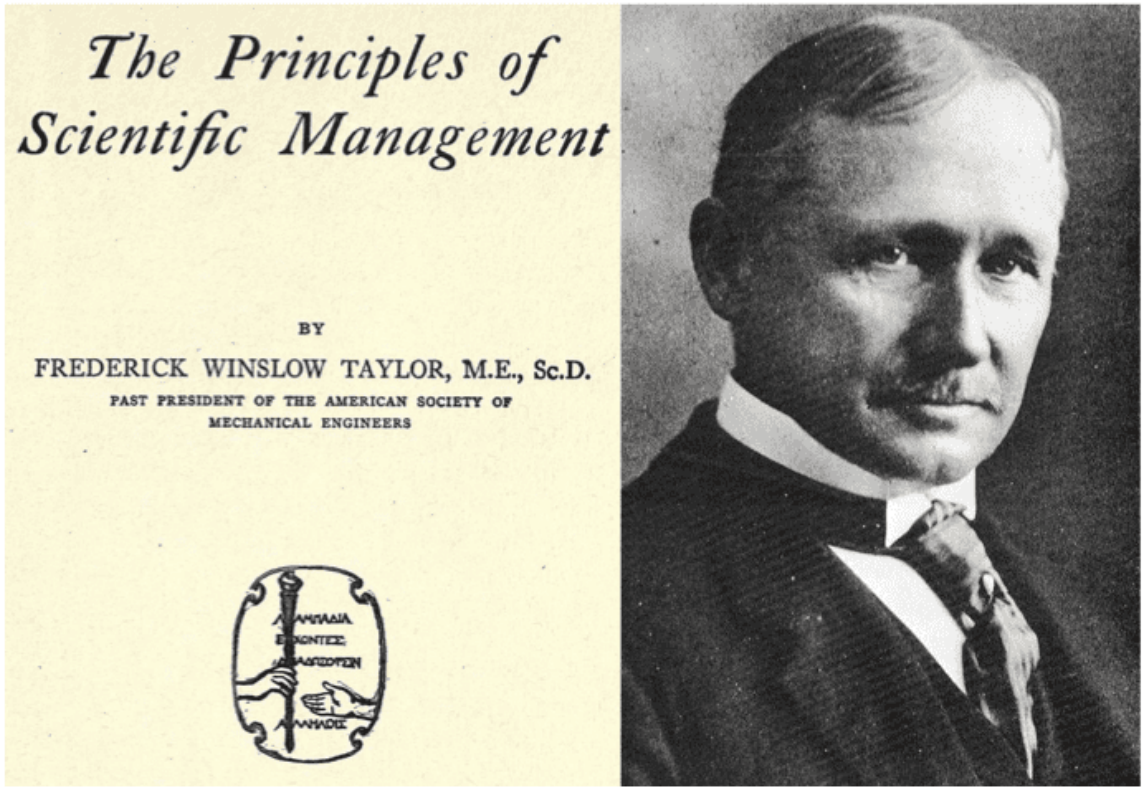
Creates a need to optimizing and integrating the value chain (scale and scope economics)

The Origins of Process Management



Henry Ford
Automation of work flow
by material means

The origins of process management



Decomposition,
Measurement and reduction of variance

Optimization of work flow

Origins of Process management

U.S. OPERATIONS RESEARCH IN WORLD WAR II

JOSEPH F. McCLOSKEY
California State University, Dominguez Hills, Carson, California
(Received May 1987; accepted August 1987)

This article, the third in a series on the early history of operations research, offers an overview of American military operations research during World War II. The first and second articles (*Operations Research* **35**, pp. 143–152 and 453–470) traced the scattered beginnings of operations research from World War I through the British experience of World War II.

INTRODUCTORY NOTE

Over the past year, as part of our celebration of the 35th anniversary of ORSA and of *Operations Research*, the Journal has presented a series of articles by Professor Joseph F. McCloskey overviewing the history of operations research. The present article concludes the series, which was undertaken with the joint sponsorship of The Institute of Management Sciences and the Operations Research Society of America. On behalf of the Editorial Board of the Journal, I would like to express our appreciation to the two societies for sponsoring this effort, and to TIMS, especially, for agreeing that it be published as a series in *Operations Research*.

Thomas L. Magnanti

Operations research had, by late 1941, established itself in the major commands of the British armed services. Formal work at the Admiralty was not yet underway, but the Navy had had ample exposure through the efforts of P. M. S. Blackett and his associates at Coastal Command, inasmuch as that group was under the operational control of the Admiralty.

How then did operations research find its way into the armed services of the United States and what were the relationships with what was going on in Britain?

Transfer of OR from Britain to the United States

The efforts of A. V. Hill and Henry Tizard, both members of Britain's Committee for the Scientific Study of Air Defence, represent the earliest handoff of OR from Britain to the United States. This was accomplished in connection with the Tizard mission to the United States in September 1940. That mission, which effected a unilateral transfer of British military science and technology to the United States, was inspired by Hill during his service as scientific attache in Ottawa and Washington. The concept was developed and sponsored by Tizard and was finally approved by Winston Churchill. The remarkable feature of the mission was that its unilateral nature was in no way to be affected by the American refusal to divulge the secrets of the Norden bombsight to the British because of the possibility that the bombsight could be recovered from a plane shot down by the Germans.

Among the secrets brought to Washington by Tizard and his associates were recent British developments in asdic (sonar), atomic energy, the influence (VT or variable time) fuze, the sonobuoy, and antiaircraft gun-laying. These were of significant interest to the U.S. scientists who sat in on the meetings, but the real prize was the cavity magnetron, the device that revolutionized radar. Its revelation led directly to the establishment of the Radiation Laboratory at the Massachusetts Institute of Technology (MIT) and to a major redirection of the U.S. effort on radar.

The Tizard mission included some very distinguished British scientists. John Cockcroft, who had done so much to recruit the scientists to nursemaid the home chain of radar stations, was Tizard's deputy. A. E. Woodward-Nutt, whose studies of the effectiveness of Bomber Command had laid the foundation

Subject classification: 601 OR/MS history.

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Operations research models and use of Analytic techniques to solve operational Problems (WWII)

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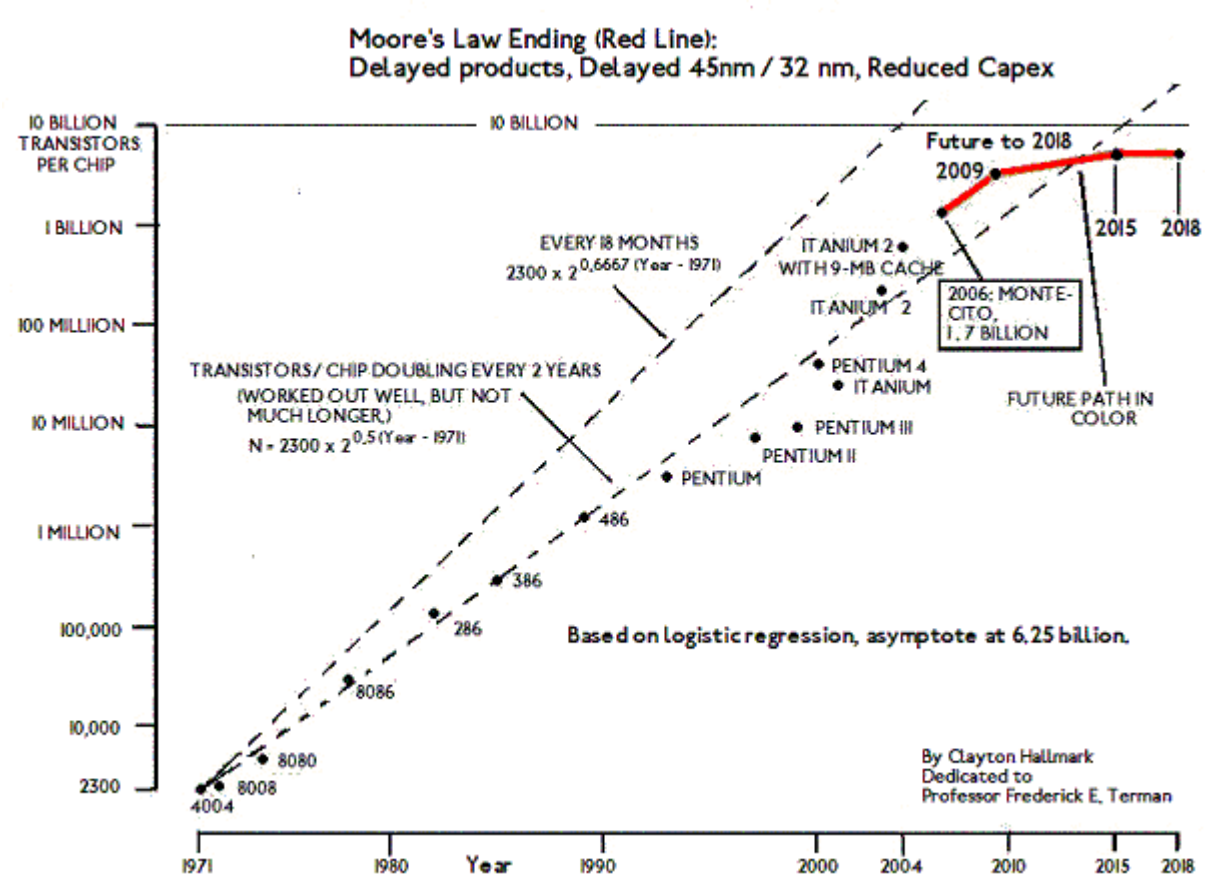
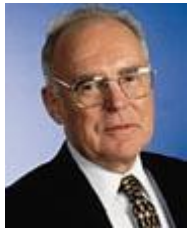
Computing Power





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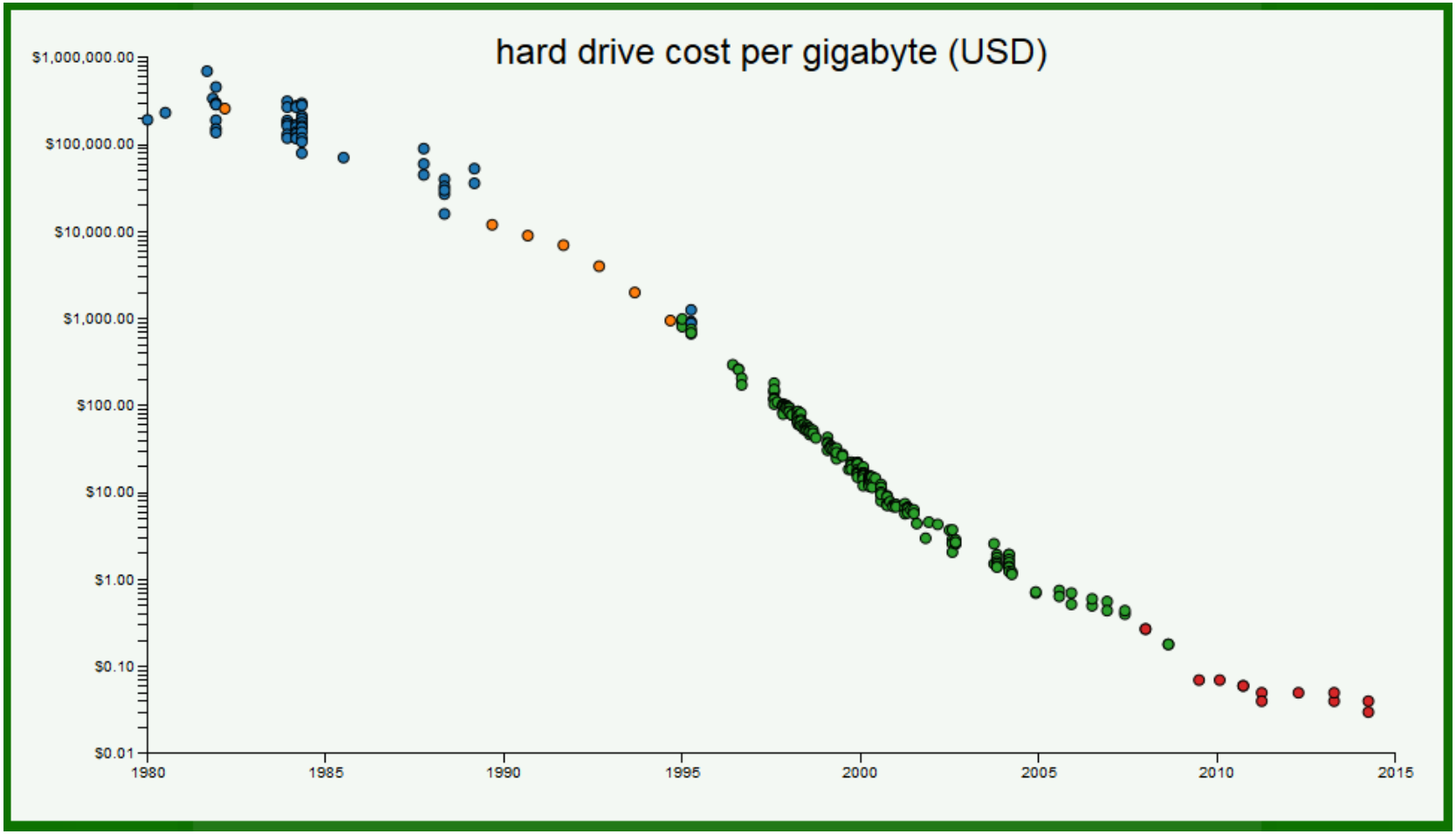
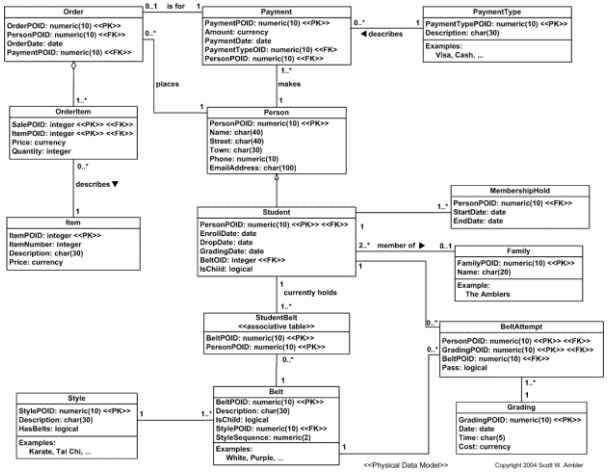
(From Brad Wheeler, Indiana University

Storage /Cost Capacity

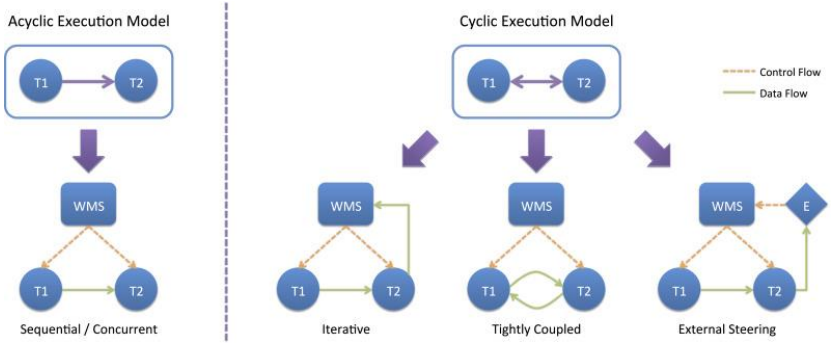


http://www.storage.ibm.com/technolo/grochows/221.htm

Integration and scaling of two technologies (70s→)



Integrate Data Bases to record and manage process and product data



Process Rules as software
Encode and glue together related activities

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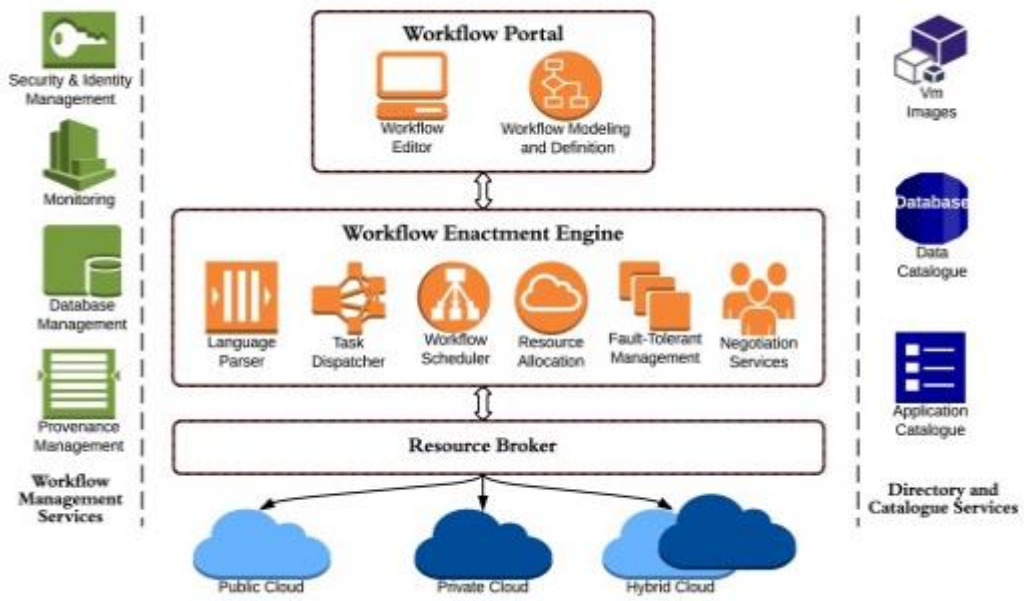
Full blown Process Management (90s→)



Full blown integration
of all aspects of work flow and
Its monitoring

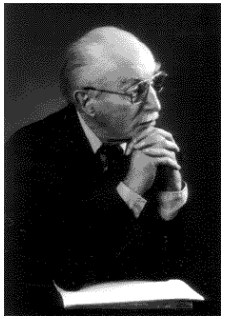
Scaling and scoping of process flows

Logic of Business Process Management

- Incremental / obliterating process design and optimization using WFMSs
- Exploit and monitor firm resources (control variance, fixed/variable task, optimize resources)
- Radical improvements in process execution and integration at intra and inter-firm levels (value chain)

Management: Routines

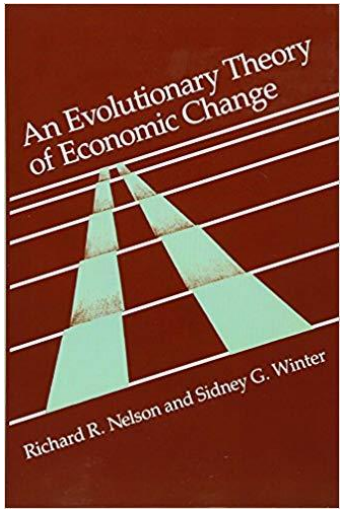
Max Weber: Bureaucracy and rules determine legitimate responses to environment



Trist & Emery: STS enable both variance enhancement and reduction depending on the environment-
Work system needs to learn and adapt, including change of its rule systems

Firm as Organized Routines

March and Simon: Organizations a nexus of evolving routines that provide responses to environmental stimuli;
Routines evolve as profiles of environmental stimuli change



Routines

Nelson and Winter: Organizations *evolve* as their nexus of routines change through variance, selection and retention

The rate and direction of the process depends on the interactions between the environment and the firm's routinized Responses (individual / organizational level responses)

Micro-Level: Routines

Latour: Practices abstract, generalized patterns (ostensive) which are situationally performed (performative)

Pentland and Feldman: Routines as ostensive and performative

Ostensive routines as maps, performances the landscape

(leads to N-K type of searches)

Routines

- Multiple logics and goals, enable coordination and varying responses to the environment
- Critical element of the structural axis of organizing
- Routines are **not** things (to be just modelled and fixed), evolve constantly and over time

Summary

- Two approaches form distinct, partially overlapping, explanation for ‘structuring’ organized activity over time
- BPM- machine, computational metaphor

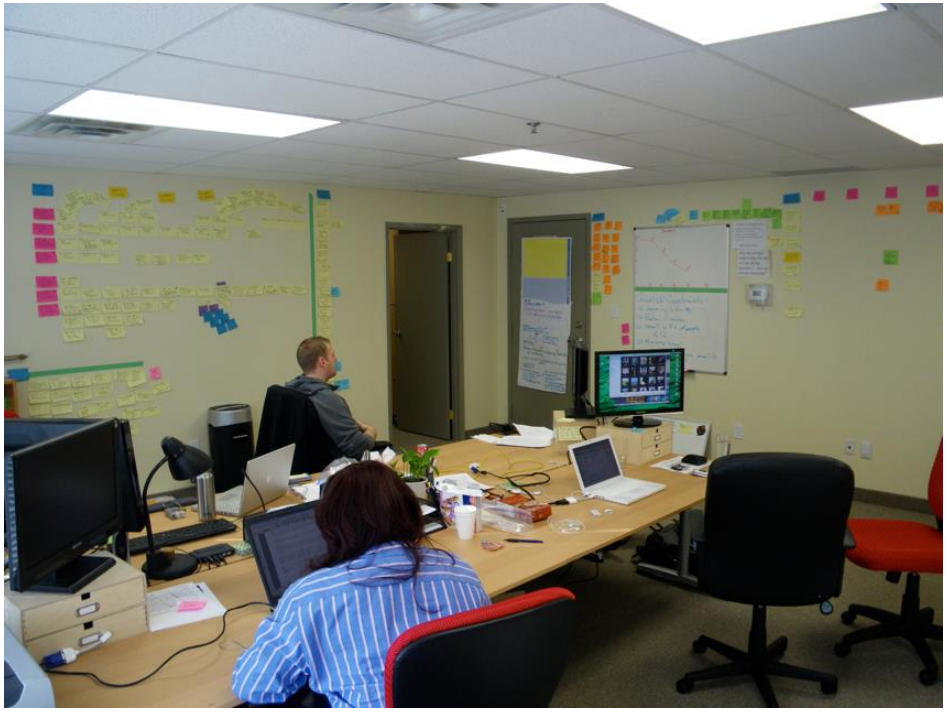
  M→ S
- Routines: social, biological and systems metaphors

  S→ M

Can they be reconciled?

Digital Intensity and Routines

Digital technology an internal element changing the substance, order, or form of routines



Digital Intensity: The degree to which activities are digitally supported and to what extent there are no alternatives for carrying out the ask

Broad Question:

How does a change in digital intensity affect the form and substance of routines?

Configural variation –composition?

Sequential variation- ordering?

Effects of Digital Technology

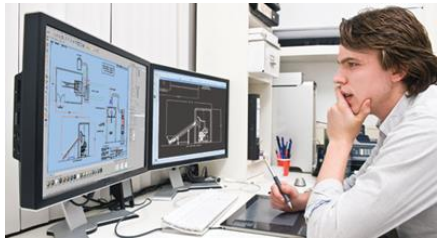
- Different Organizations?
- Different / Similar Organizational Structure?
- Different / Similar Environment?
- Different characteristics of the persons or teams?

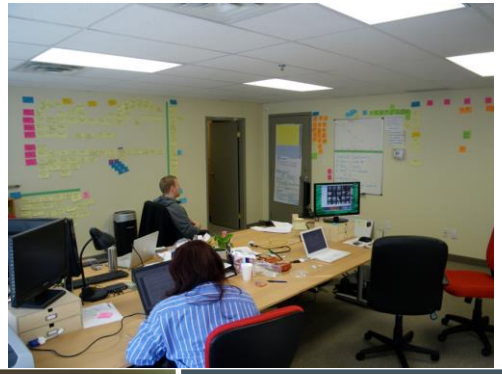
- Are routines shaped more by the external environment (technology) or by internal features of the organization?
- "*…answers to these questions seem a long way off at the moment…* "

(Pentland et al. 2009).

Composition of Routines

Configural variety of (Sociotechnical) Routine:





Actor: Designer X

Activity: Generate

Goal: Design

Tool: Synopsis

Affordance: Create&Analyze

Dataflow: Constraints, RTL; Physical Layout

Location: Co-located

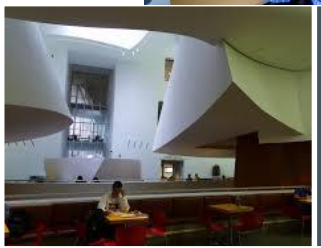
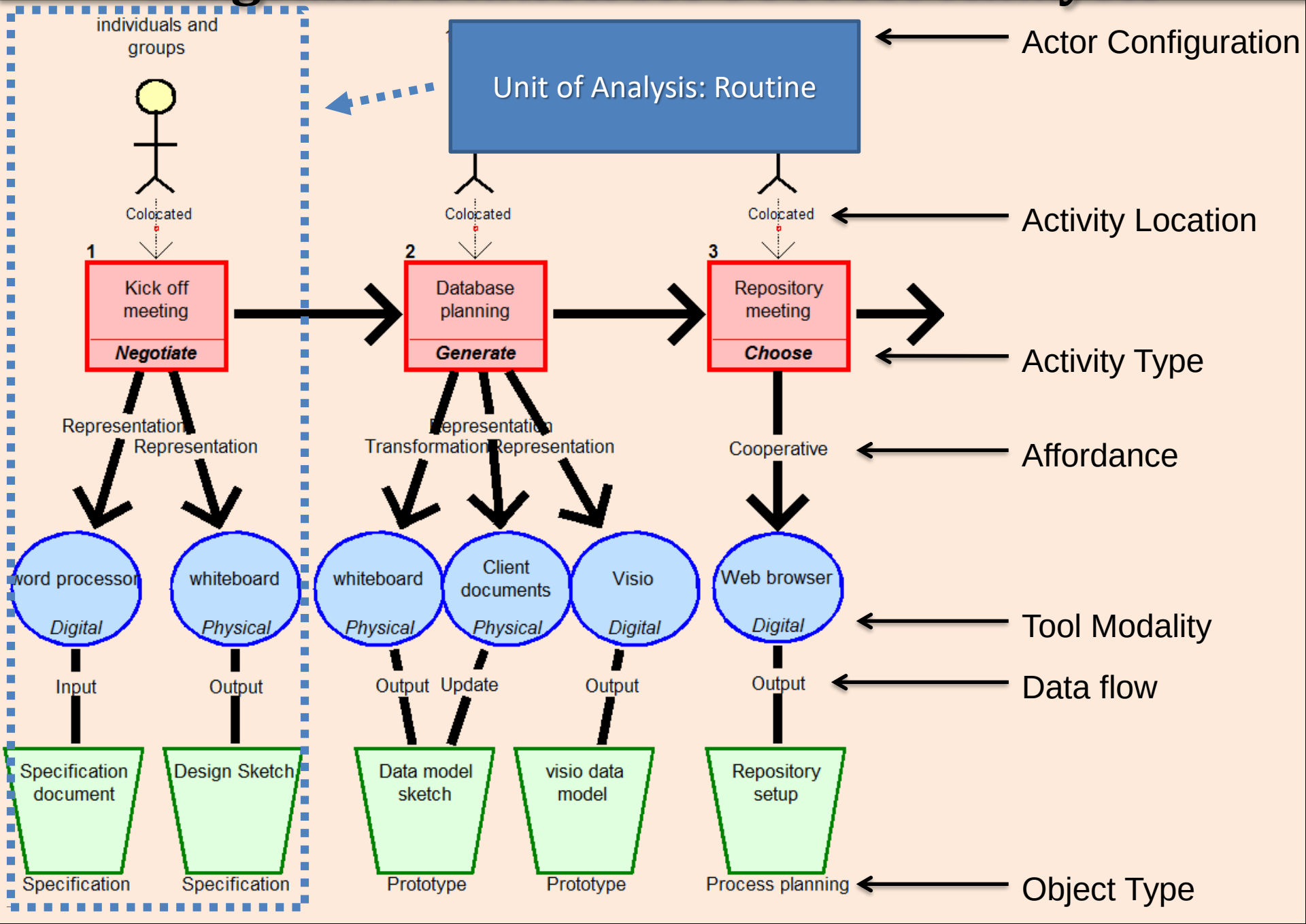
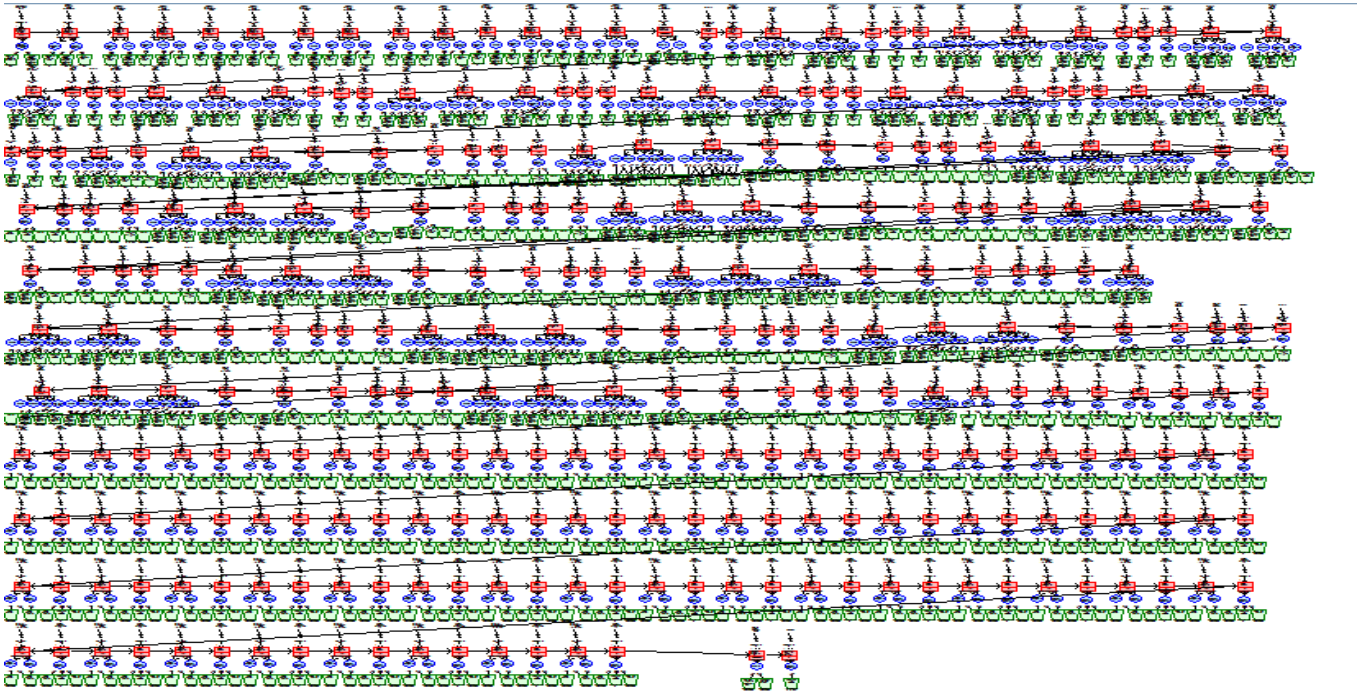


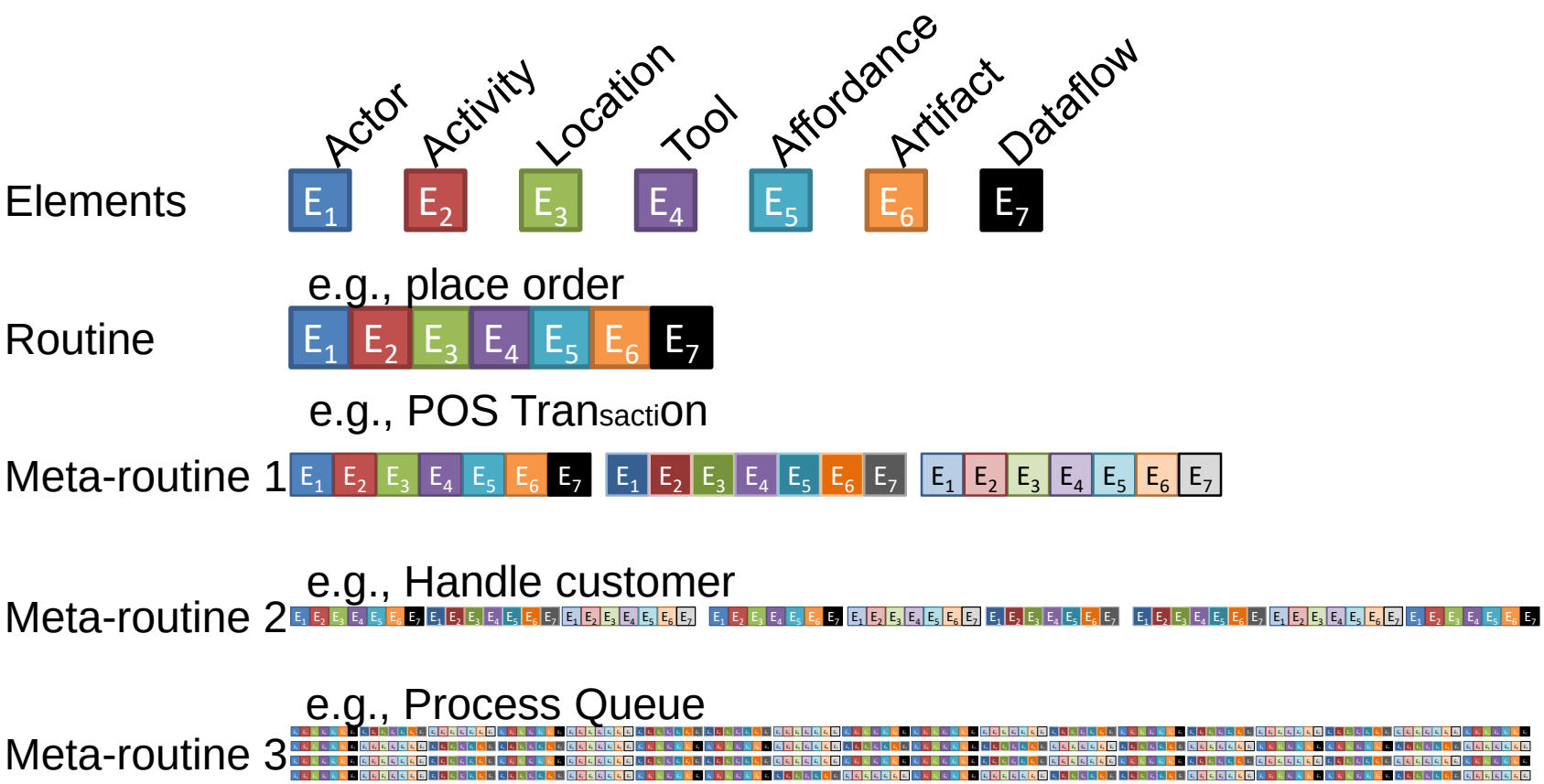
Diagram Notation for Process Analysis



Typical work flow in a large system



Composition of Routines



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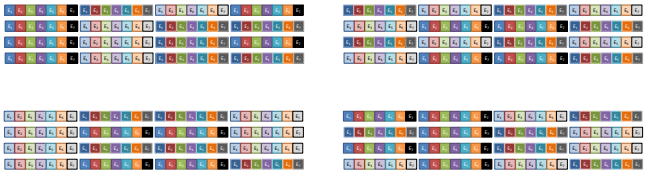
Variation among Digitally-enabled Design Routines

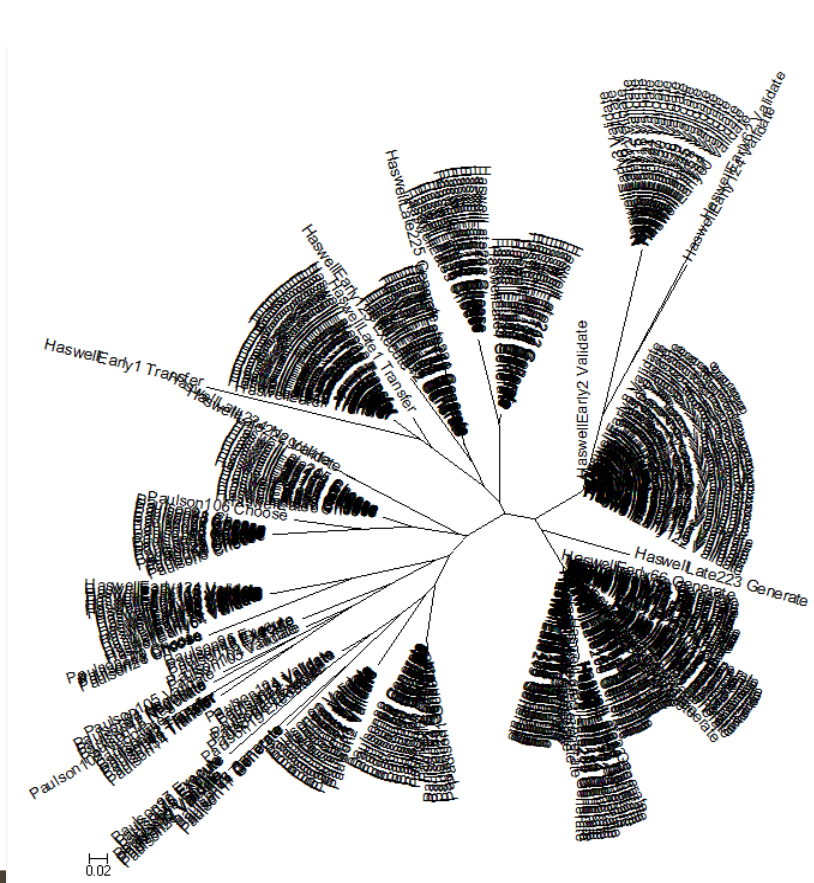


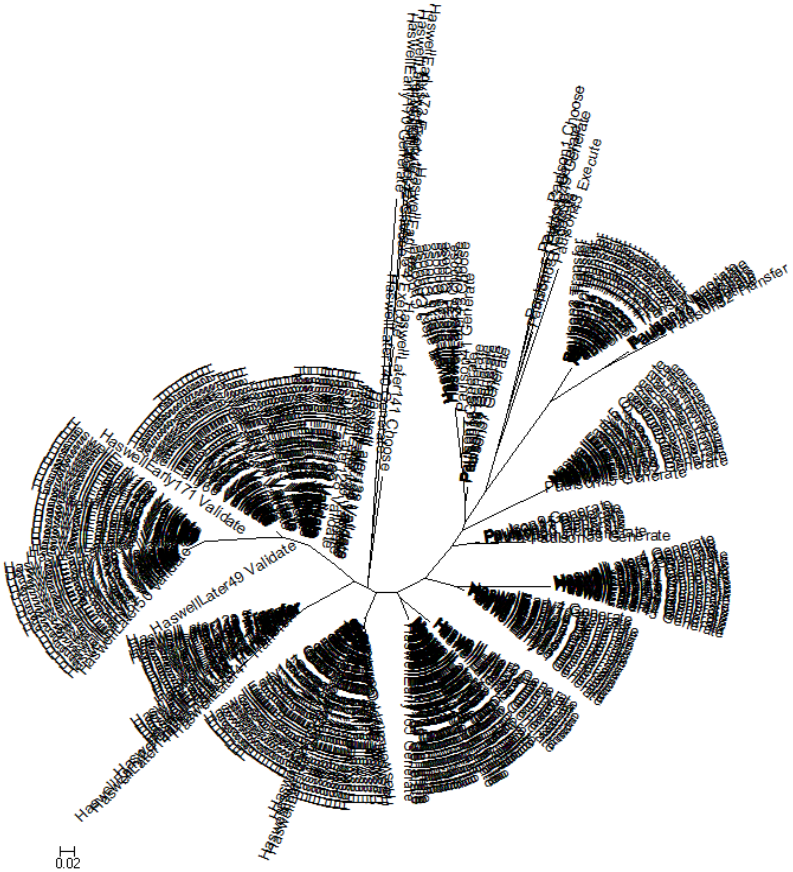
Compare "Align"

Complex routine

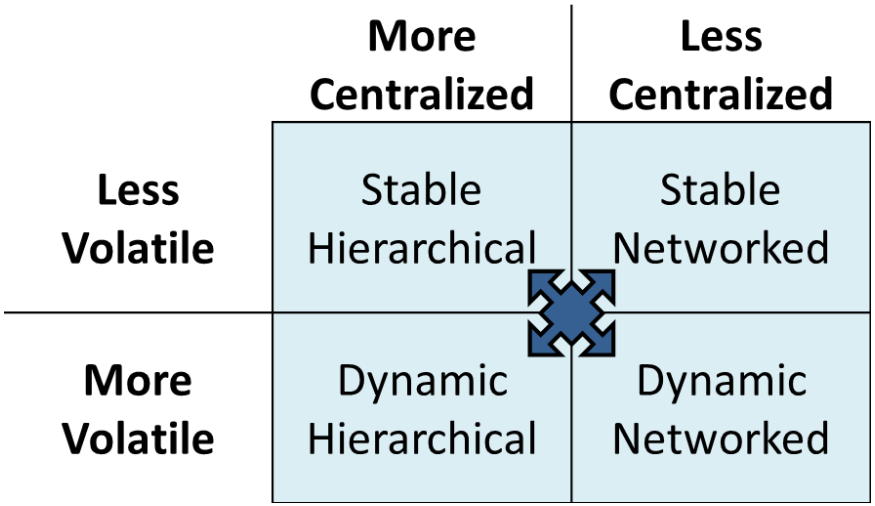
Clustering of routine components

Two chip design processes using different digital tools with the same task





Routines vary less within an organization than across organizations

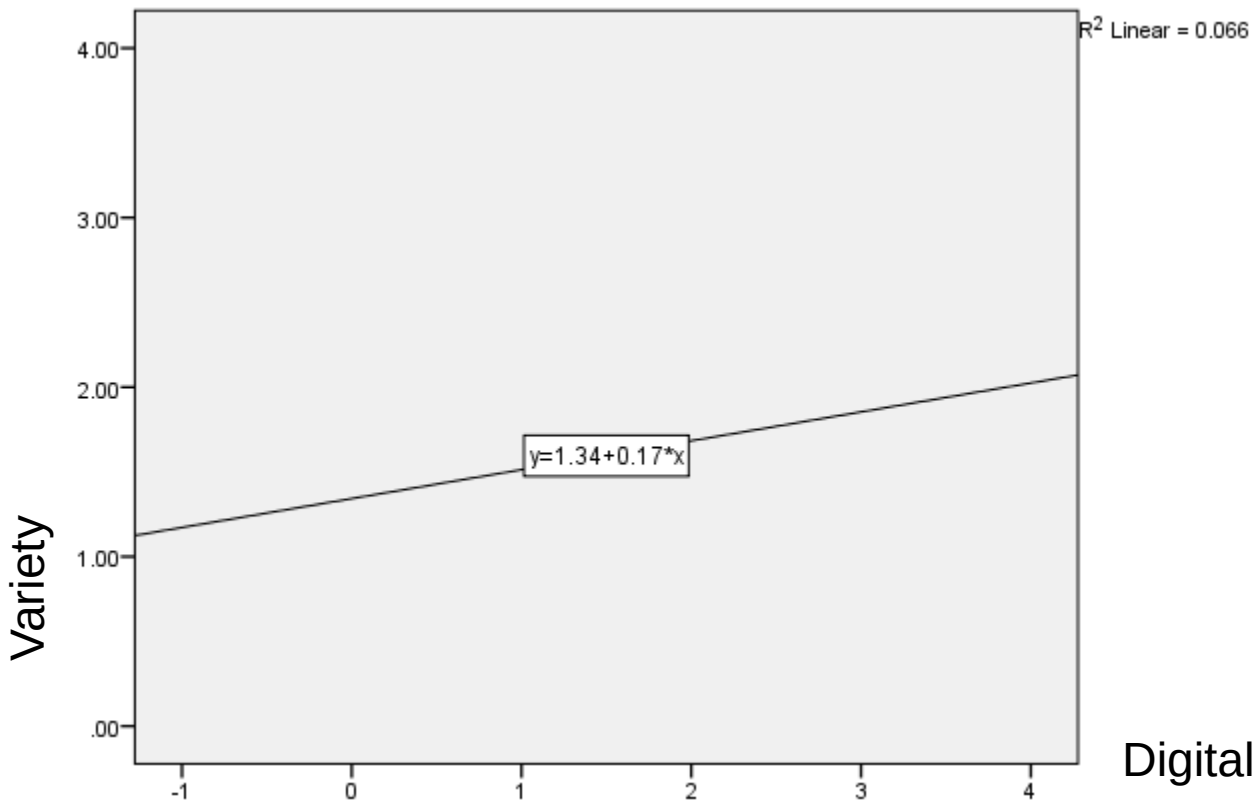


Supported:

	Alpha	Beta	Delta	Gamma
Alpha	**34%**			
Beta	47%	**33%**		
Delta	44%	48%	**40%**	
Gamma	46%	48%	43%	**31%**

**All p-values for pairwise comparisons are < 0.001*

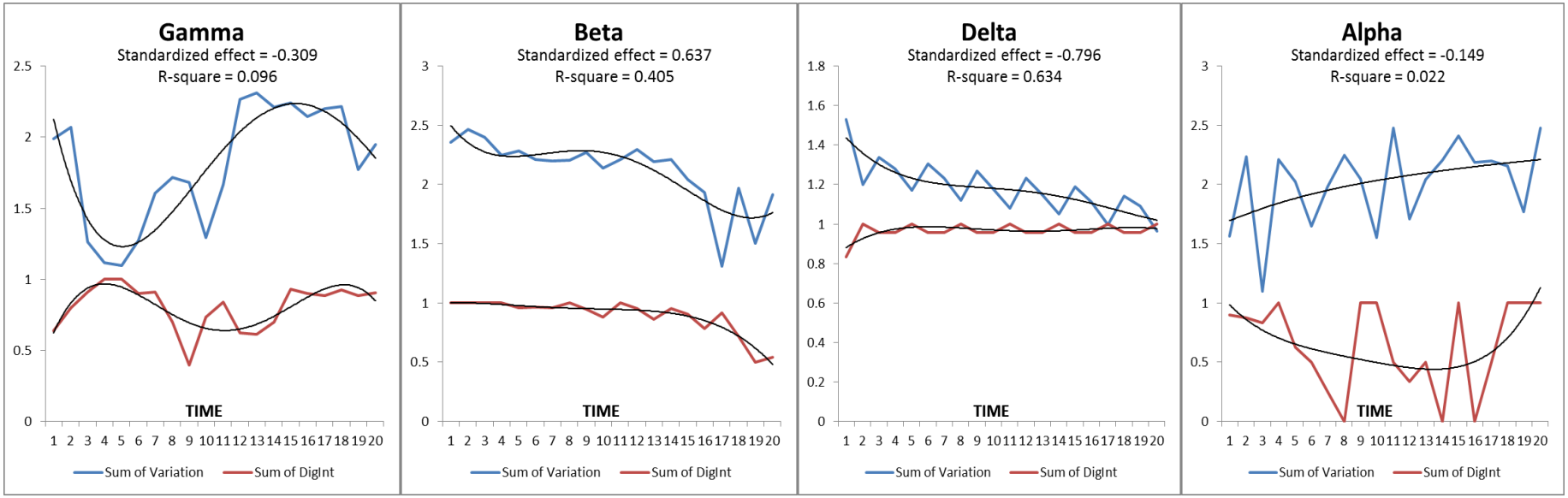
Digital Intensity → Configural Variation



Supported:

-0.258 (t=-12.829, R^2=0.06, p<0.001; n=623)

Dynamic analysis



Organization (Type)	Beta first half	Beta second half	Change
Alpha (Stable Hierarchical)	-0.202	-0.109	Weakened
Beta (Stable Networked)	0.612*	-0.265	Flipped
Delta (Dynamic Networked)	-0.869***	-0.962**	Strengthened
Gamma (Dynamic Hierarchical)	-0.513*	0.451	Flipped

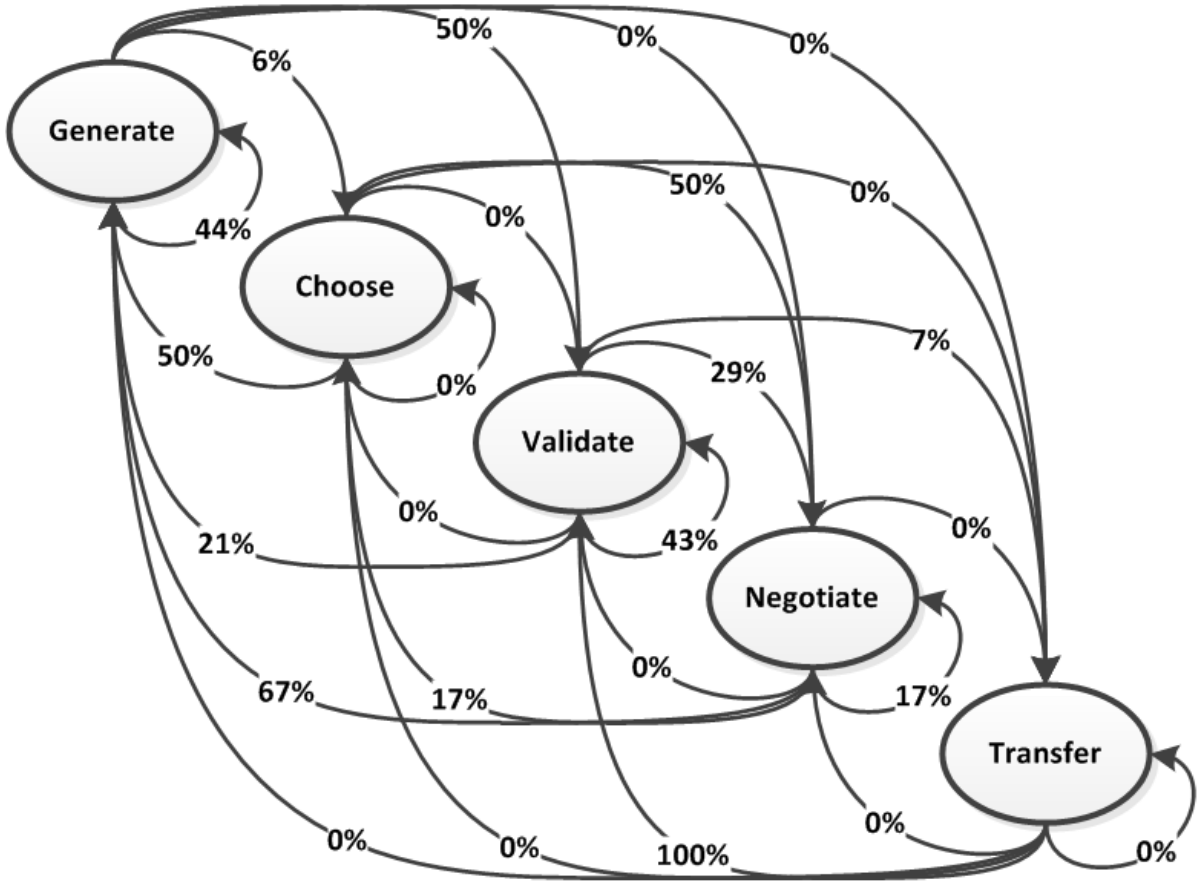
Main conclusions

- **In general, digital intensity reduces configural variety in routines**
- **Organizations predict more configural variety**
- **Less variation with increasingly centralized organizational contexts.**
- **Volatile environments have less design routine variation**

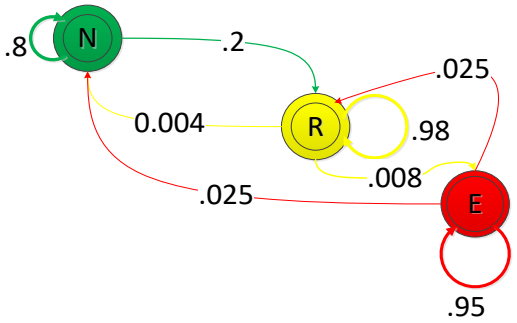
	More Centralized	**Less Centralized**
Less Volatile	Stable Hierarchical	Stable Networked
More Volatile	Dynamic Hierarchical	Dynamic Networked

Sequential Variety: First order Markov Chains

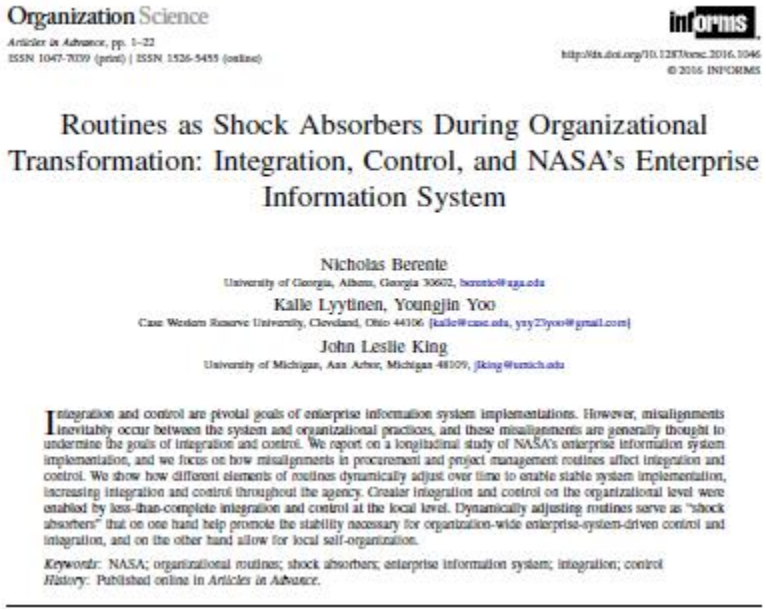
(This is for one site, but can be statistically compared to multiple other sites for structural/transitory equivalence.)



Complex Iterative structures- 3 waterfall projects (Thummadi & Lyytinen, 2019)



Digitalization and the evolution of routines



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Routines as Shock Absorbers During Organizational Transformation: Integration, Control, and NASA's Enterprise Information System

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Integration and control are pivotal goals of enterprise information system implementations. However, misalignments inevitably occur between the system and organizational practices, and these misalignments are generally thought to undermine the goals of integration and control. We report on a longitudinal study of NASA's enterprise information system implementation, and we focus on how misalignments in procurement and project management routines affect integration and control. We show how different elements of routines dynamically adjust over time to enable stable system implementation, increasing integration and control throughout the agency. Greater integration and control on the organizational level were enabled by less-than-complete integration and control at the local level. Dynamically adjusting routines serve as "shock absorbers" that on one hand help promote the stability necessary for organization-wide enterprise-system-driven control and integration, and on the other hand allow for local self-organization.

Keywords: NASA; organizational routines; shock absorbers; enterprise information system; integration; control
History: Published online in *Articles in Advance*.

Study of 10 year implementation of Financial System in NASA

Routines adapted dynamically to adjust to external shocks created by introduction by IT systems

Alignment is never 'complete' but routines Act as **shock absorbers** to integrate Work flow to organization and vice versa

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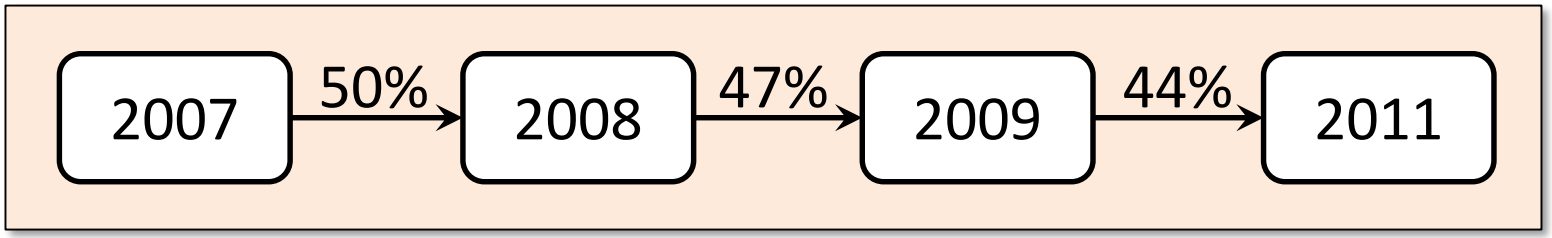
Digitization and evolution of routines (Gaskin et al 2013)

Rate of Change Decreases over Time

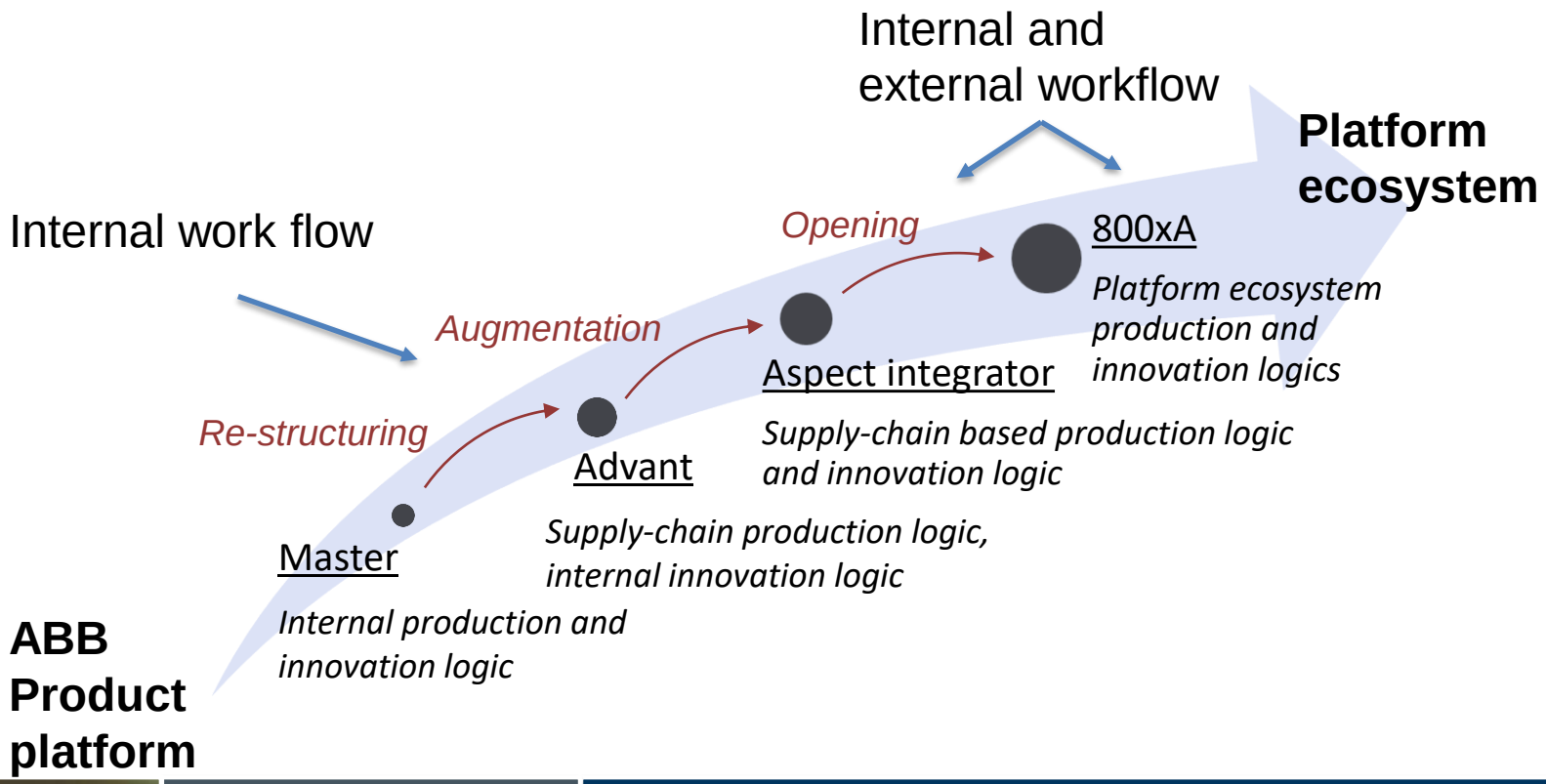


*Context: Virtual design of complex buildings (like hospitals)

Summary

- Implementing workflow systems *change organizational routines*
- Change is *not automatic and predictable*
- *Change* happens in the *substance*, *form* and *order* of activities
- Generally reduces configurational variation (stasis)
- Effect on sequential variation less predictable and relates to types of systems (strict ordering of activities)- Harem and Pentland (2010) no effect of workflow structuring in accounting activities
- Digitization initially increases variation but the rate of change decreases over time
- Routine structures and their order are reasonable predictors for performance (Lindberg et al 2016)

Routine Evolution as a response digitalization tensions and opportunities

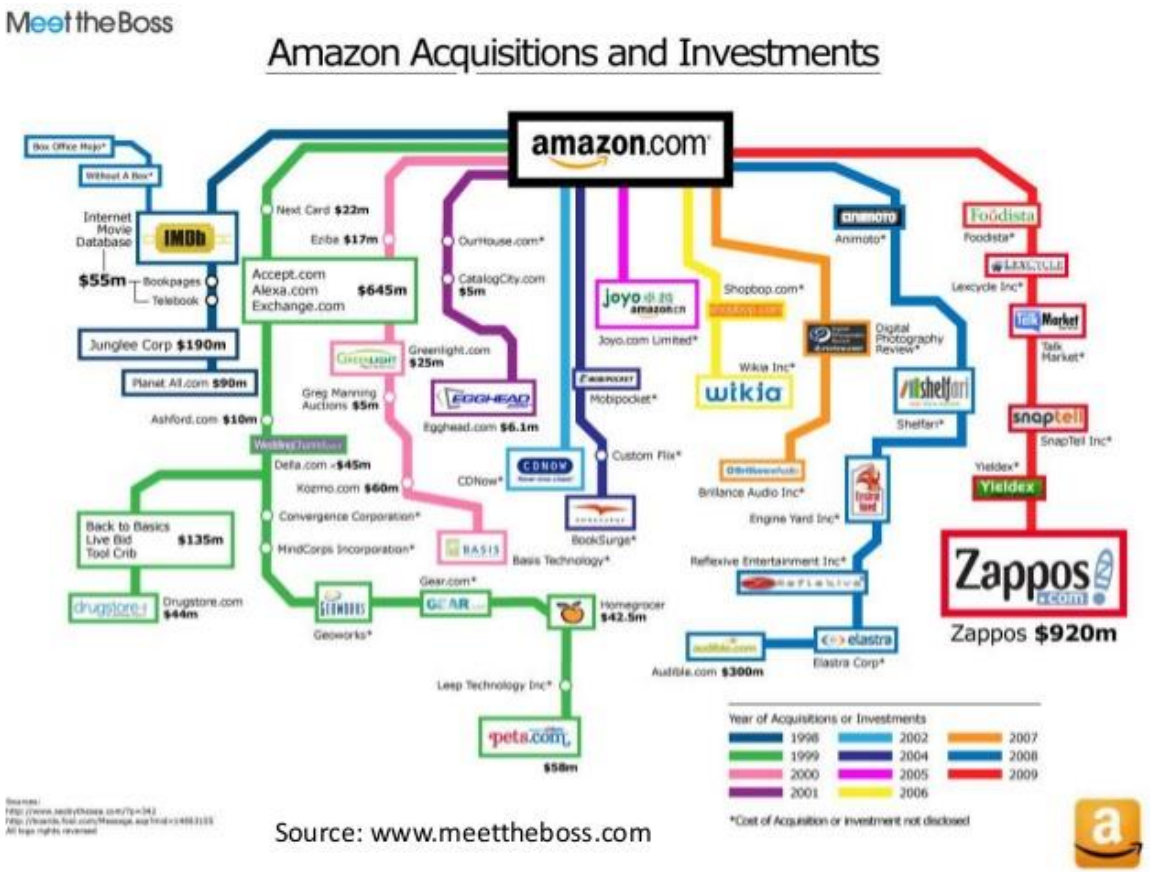


Digitalization and routines

Automation and workflow efficiency forms an **element of a broader** business model change

Routine transformation is complementary **not** substitute of business model change

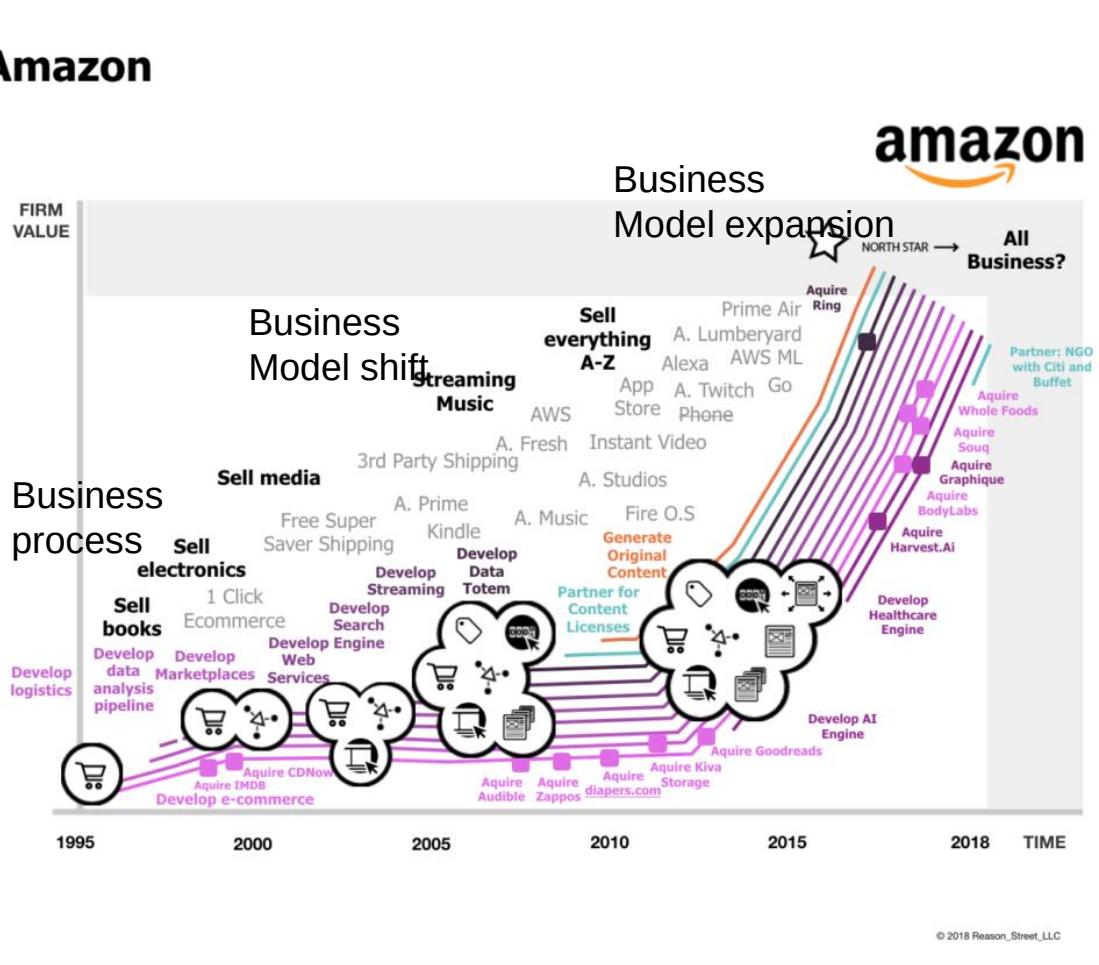
Amazon (1998-2010)



Amazon (1995-2018)

Reuse and Expansion of Digital Assets

Innovate with business models

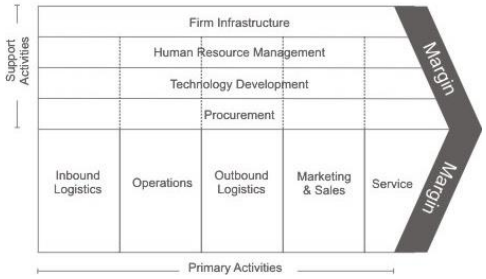


Amazon: work flow

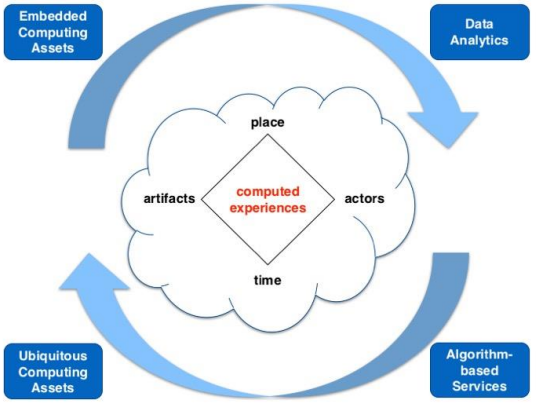
Amazon's warehouse-worker tracking system can automatically pick people to fire without a human supervisor's involvement

New value (co-)creation process

signs & symbols



purchase



user

producer

Value co-creation

BPM sits here

Business model Innovation sits here

Constant alignment of **design-solution** pairs

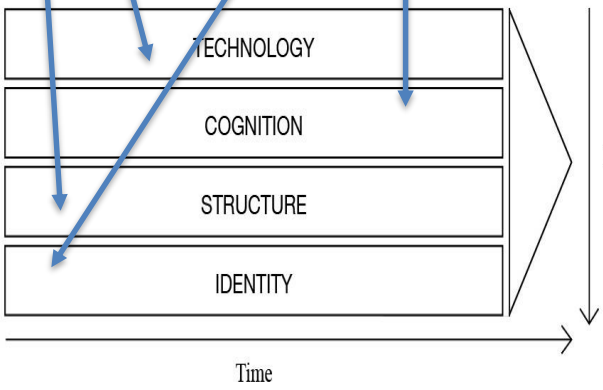
Digital Design Space

Value System Design

Business System Design

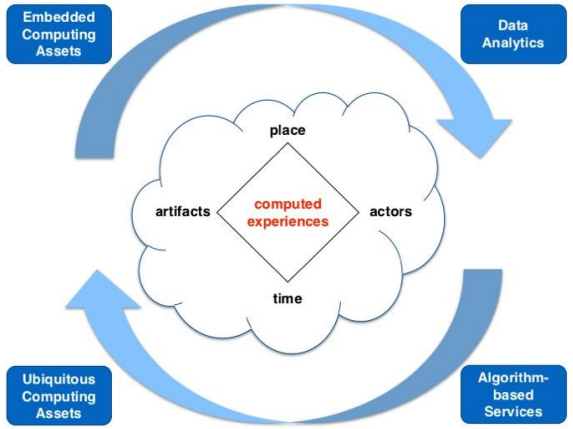
Value Creation Logic

Configuration Logic



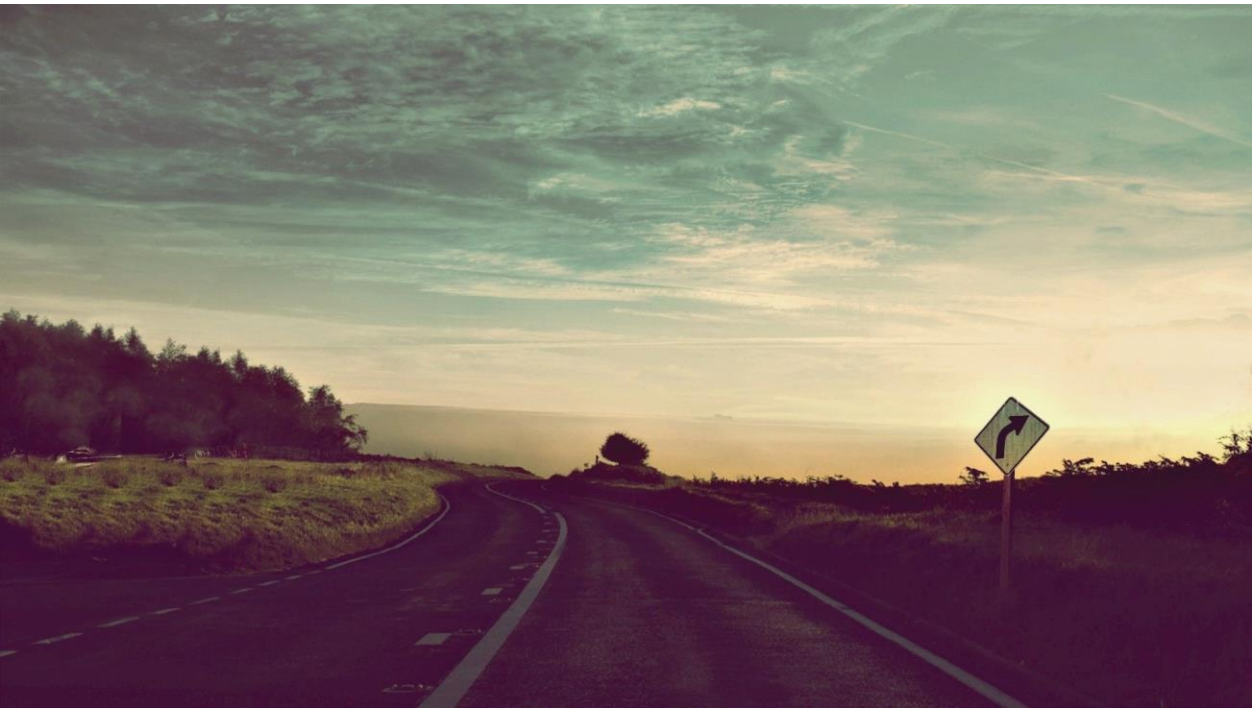
Digitalization

Expansion, Push



Alignment, Pull

WEATHERHEAD SCHOOL OF MANAGEMENT
CASE WESTERN RESERVE UNIVERSITY



(R) Evolutionary
Change that covers
Business models

Interactions and capabilities to reconfigure resources through work flow design

Design for experience (in Work flow)

Emerging technologies such as AI and block-chain form the new frontier of routine Change and associated management of work flow