Systems Development in Praxis (SDP)

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Course format

Reading before the lecture is critical!

Sessions: Thursdays 12:30 – 14:15, where we <u>discuss</u> research papers and cases of praxis

Activities: Guest lectures from industry and a company visit to interview software practitioners

Exam: You will individually write a short paper reporting a theory-directed analysis of the interviews

Time requirements (5 ECTS ~ 150 hours): Reading 75h / exam assignment 50h / sessions 25h

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Knowledge

The student should gain knowledge of advanced topics within systems development in theory and praxis. The topics may include but are not limited to:

- analysis of systems development praxis

- systems development methods, processes, and competencies

- organization and management of systems development

- development of systems for complex settings such as supporting organizational cooperation, knowledge intensive systems, and information infrastructures.

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Skills

- understand and present the course topics, which includes its terms, problems, theories, methods, results, and conclusions.

- apply theories and methods to analyze and describe a problem in systems development praxis

- criticize theories and methods within systems development.

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Competencies

The capability to describe, analyze, and assess a defined praxis in a systems development organization, including:

- relate to the course theories and empirical methods

- and contrast with related topics such as requirements management, quality control, outsourcing, distributed development, agile processes, and model-driven processes.

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Individual written exam

A short paper (4-5 pages) that reports a theory-directed analysis of a systems development praxis (Norlys). The student is expected to:

- select, explain, and use one of the theories presented in the course

- report an analysis that addresses a problem statement of relevance to both the theory and practice of systems development

- discuss the results from the analysis in relation to one or more theories presented in the course.

You can see an example in the 2nd lecture: "Brandborg (2017) Hyper-learning in Netcompany"

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Problems in systems development

DR POLSAG UPDATE POLSAG DROPPER DYRT IT-SYSTEM

Statsligt it-system koster nu 5 mia. kr - men er ikke færdigt: »Vi står tilbage med noget juks«
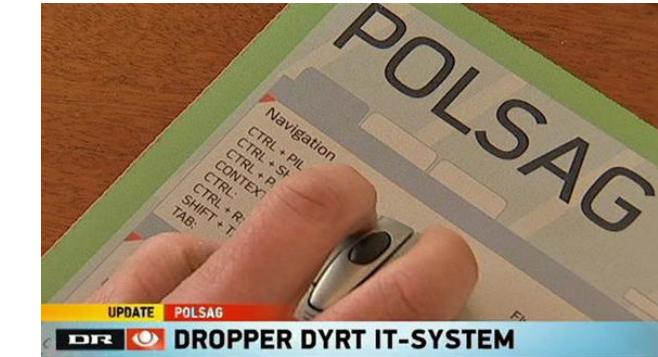
It-projekter · 1. juli 2025 · 19 kommentarer

Oprindelig pris: 96 m. i 2014

Skats gamle it-systemer blokerer for lavere fødevarepriser: Bliver først klar i 2030

It-arkitektur · 29. januar · 15 kommentarer

https://www.version2.dk/emne/it-projekter

Regningen er eksploderet på kritisk politisystem: Prisen kan stadig vokse

Politi-IT · 29. januar kl. 05:00 · 1 kommentar

Rigspolitiet afslutter et centralt it-projekt på Schengen-området. I praksis er systemet dog ikke helt færdig, da en række leverancer udestår. Illustration: Claus Fisker/Ritzau Scanpix.

Udviklingen af Schengen-system til fælles jagt på efterlyste er gået langt over budget. Nu er projektet færdigt – men regningen kan fortsat vokse.

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IT projects are riskier than handling nuclear waste!

- Study of 11.011 projects' cost overruns comparing 5.360 IT projects with 22 other project types.

- The average IT project cost overrun is 73%.

- IT projects have a "fat tale" of extreme cost overruns, with a mean overrun of **553%**

Table 2. Frequency of Cost Overruns per Project Type, Ranked by Mean in Tail, N = 11,011

Project Type	N	Percentage of Projects with Cost Overrun	Percentage of Projects with a Cost Overrun Greater Than 1.5	Mean Overrun for Projects with a Cost Overrun Greater Than 1.5
IT	5,360	40.86	18.26	5.53
Nuclear storage	25	92	52	5.27
Defense	115	52.17	20	3.6
Nuclear power	196	96.94	54.59	3.04
Dams (other)	21	71.43	33.33	3.02
Olympics	21	100	76.19	3

Flyvbjerg, B., Budzier, A., Aaen, J., Keil, M., & Zottoli, M. (2025). The Uniqueness of IT Cost Risk: A Cross-Group Comparison of 23 Project Types. *Project Management Journal*. https://doi.org/10.1177/87569728251340590

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Problems in systems development

What do you see as the biggest challenge to successful systems development?

Statsligt it-system koster nu 5 mia. kr - men er ikke færdigt: »Vi står tilbage med noget juks«
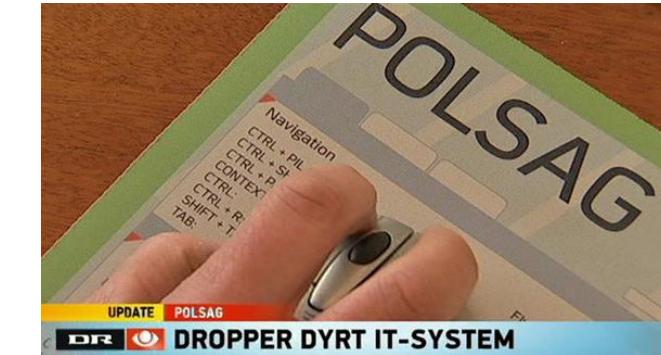
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Explaining the (management) problem

Weinberg (1982) overstructured management of software engineering

DEAL model explanation, page 3:
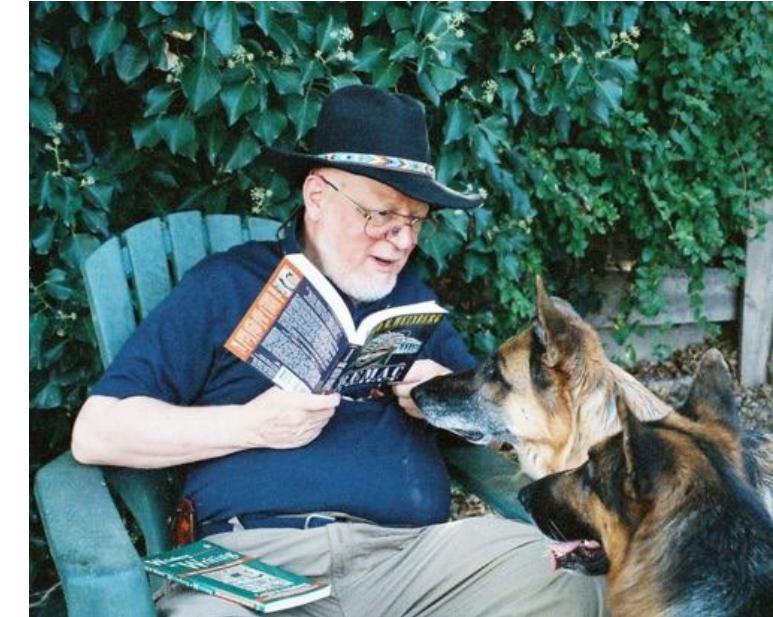
D - Difficulty of the task

E – Effort put into doing the task

A – Ability relevant to the task

L – Luck

Focus of unsuccessful managers (D & L) / successful managers (E & A)

What are typical examples of difficulties or bad luck for software project managers (or students)?

Gerald Weinberg
(1933 – 2018)
http://geraldmweinberg.com/

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Overstructured management of software engineering (Weinberg 1982)

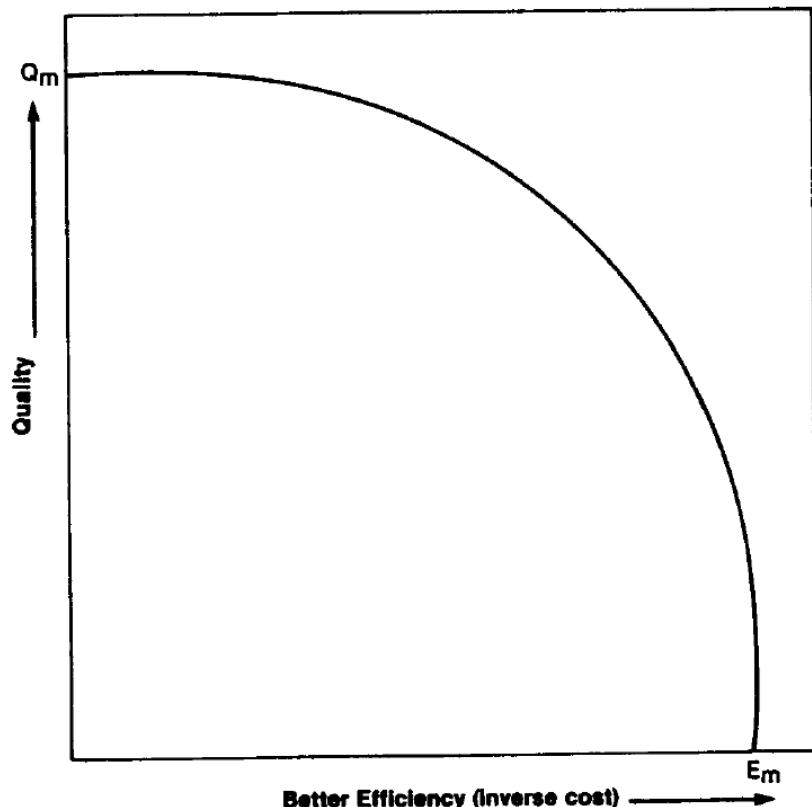| Control structure	Explanation	Question to present day praxis
Sequence (p.3-4)	structure software projects so that important events take place in fixed, pre-determined sequences.	Is this problem (e.g. killing projects or features) outdated with agile methods?
Choice (p.4-5)	The selection of one of two alternatives … a simple choice structure often fails in the fuzzier situations more typical of human activities.	How should software developers balance efficiency and quality when using generative AI?
Modularization (p.5-6)	one module, one function… allows the substitution of labelling for thinking.	Do interdisciplinary agile teams without specialized roles solve this problem?
Iteration (p.6)	… repeats the same cliché over and over, as if it is a magical incantation that will solve problems.	Is agile (or generative AI) becoming a cliché or magical incantation?
Recursion (p.6-7)	… the technique of a system containing itself.	Are software failures simply because of buyers, managers, politicians, or users?

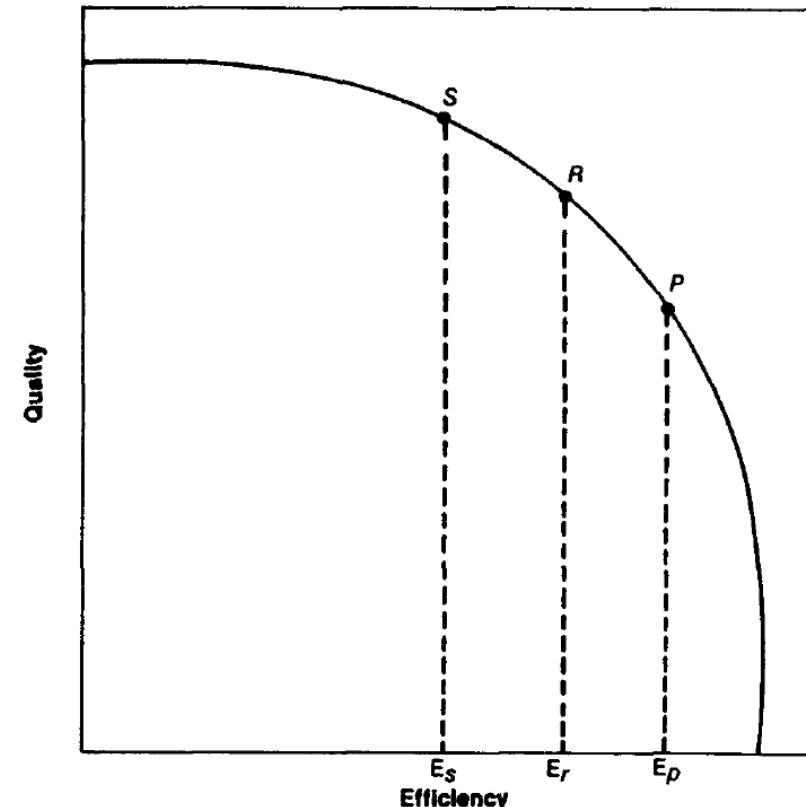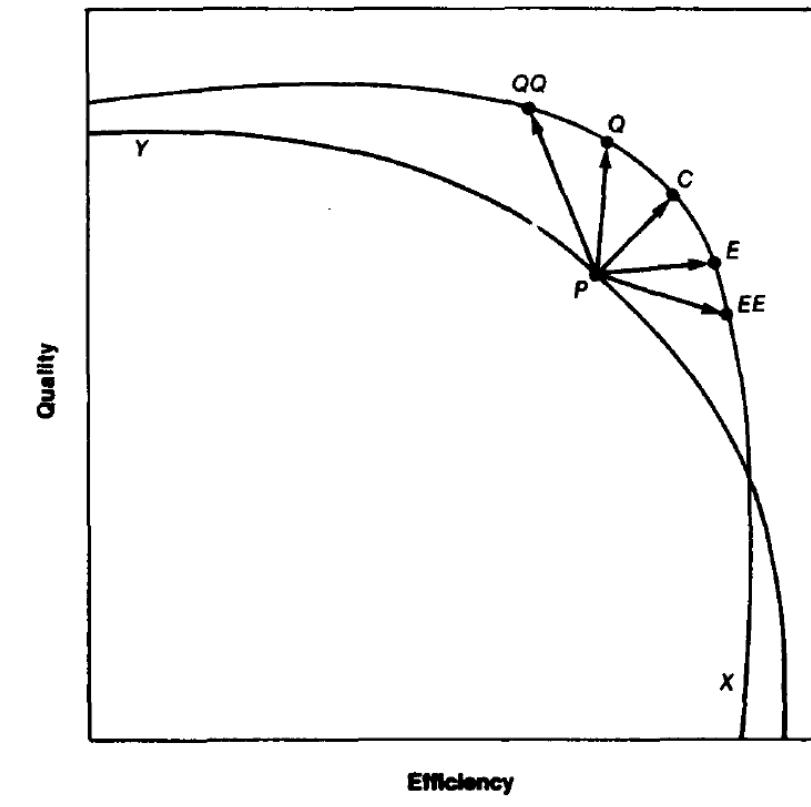# Choice (Weinberg 1982, p. 4-5)

Figure 1.

Figure 2.
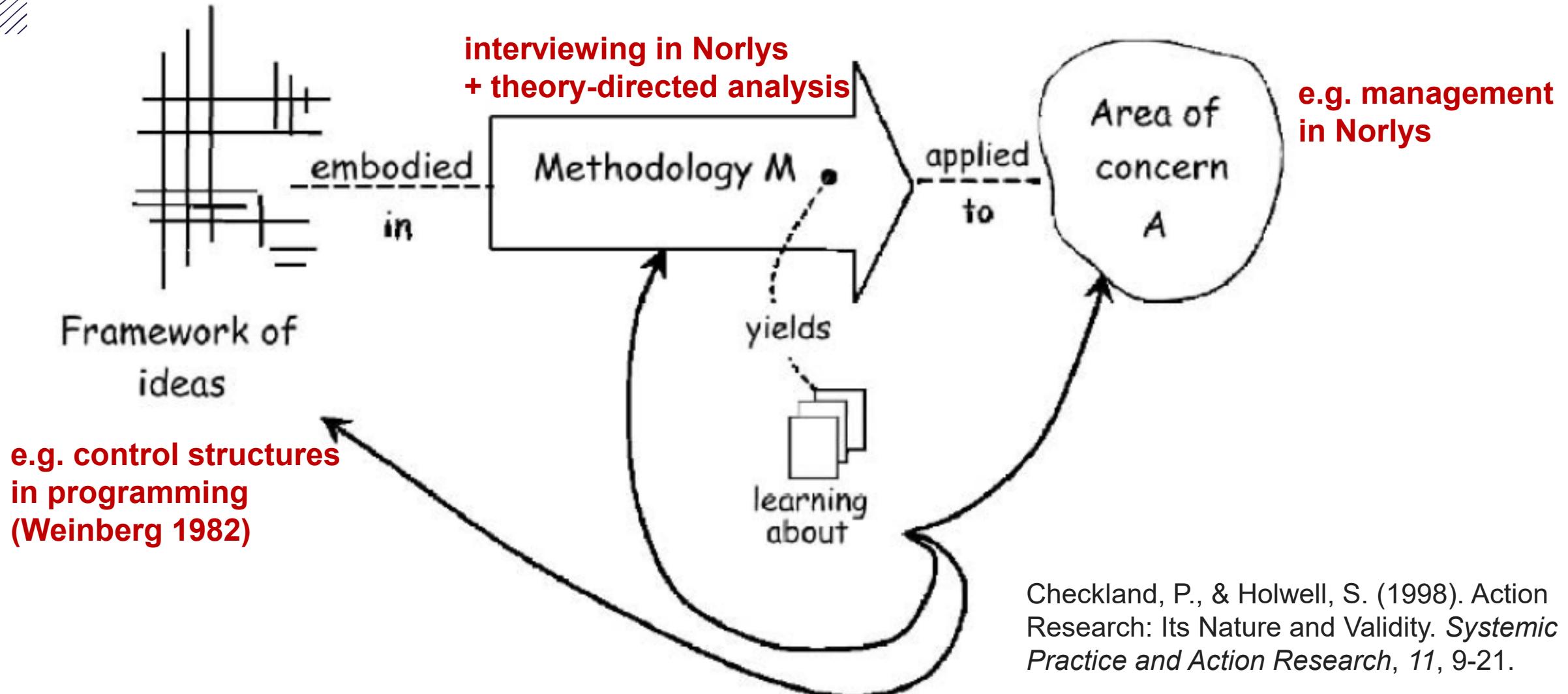
Figure 3.

A simple model of the research process

interviewing in Norlys
+ theory-directed analysis

e.g. management
in Norlys

embodied in Methodology M applied to Area of concern A

yields

learning about

Framework of ideas

e.g. control structures
in programming
(Weinberg 1982)

Checkland, P., & Holwell, S. (1998). Action Research: Its Nature and Validity. *Systemic Practice and Action Research*, *11*, 9-21.

Four Paradigms of Information Systems Development

Developing computer-based information systems necessarily involves making a number of implicit and explicit assumptions. The authors examine four different approaches to information systems development.

Rudy Hirschheim and Heinz K. Klein

Starts with two examples of systems development projects:

- Automating Typesetting or Enhancing Craftsmanship?
- Developing an Expert System or a System for Experts?

What is pursued in today's praxis (e.g., with Generative AI)?

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Hirschheim, R., & Klein, H. K. (1989). Four paradigms of information systems development. *Communications of the ACM, 32*(10), 1199-1216.

explanations of the status quo, social order, social integration, consensus, need satisfaction, and rational choice

explanation within the realm of individual consciousness and subjectivity, and within the frame of reference of the social actor as opposed to the observer of the action.

ORDER

Functionalism

Social Relativism

OBJECTIVISM ← → SUBJECTIVISM

Radical Structuralism

Neohumanism

CONFLICT

emphasizes the need to overthrow or transcend the limitations placed on existing social and organizational arrangements

seeks radical change, emancipation, and potentiality, and stresses the role that different social and organizational forces play in understanding change
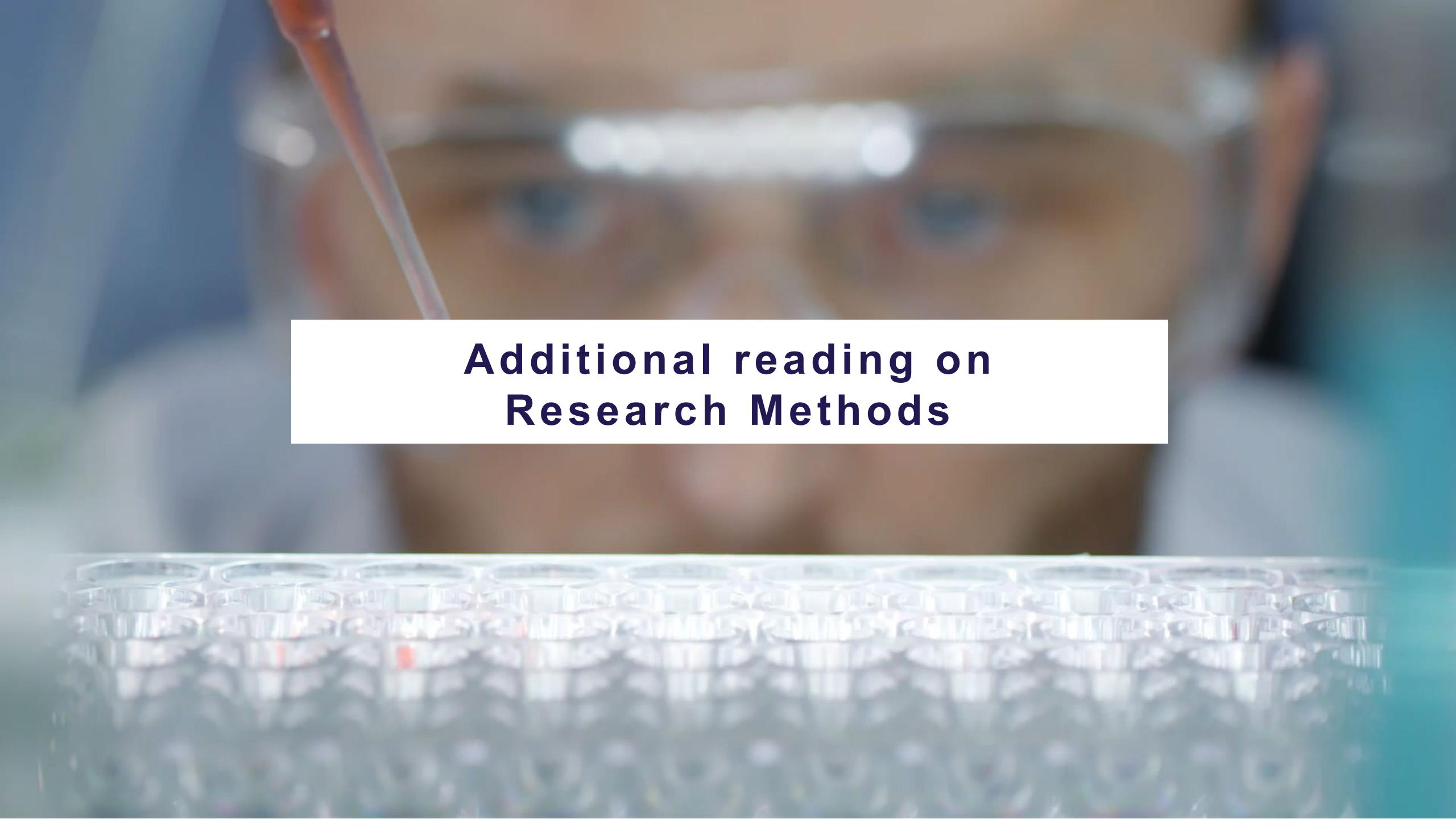
FIGURE 1. Information Systems Development Paradigms (adapted from [18])

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(Hirschheim & Klein, 1989, p. 1201-1202)

TABLE I. Summary of the Four Paradigms

Paradigm	Developer archetype	Systems development procceds	Elements used in defining IS	Examples
Functionalism	Expert or Platonic Philosopher King	From without, by application of formal concepts through planned intervention with rationalistic tools and methods	People, hardware, software, rules (organizational procedures) as physical or formal, objective entities	Structured analysis, information engineering
Social Relativism	Catalyst or Facilitator	From within, by improving subjective understanding and cultural sensitivity through adapting to internal forces of evolutionary social change	Subjectivity of meanings, symbolic structures affecting evolution of sense, making and sharing of meanings, metaphors	Ethnographic approaches, FLORENCE project
Radical Structuralism	Warrior for Social Progress or Partisan	From without, by raising ideological conscience and consciousness through organized political action and adaptation of tools and methods to different social class interests	People, hardware, software, rules (organizational procedures) as physical or formal, objective entities put in the service of economic class interests	Trade-union led approaches, UTOPIA and DEMOS projects
Neohumanism	Emancipator or Social Therapist	From within, by improving human understanding and the rationality of human action through emancipation of suppressed interests and liberation from unwarranted natural and social constraints	People, hardware, software, rules (organizational procedures) as physical or formal objective entities for the TKI; subjectivity of meanings and intersubjectivity of language use in other knowledge interests	Critical social theory, SAMPO project

Which dominates in your education?

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(Hirschheim & Klein, 1989, p. 1210)

Additional reading on
Research Methods

How should we investigate praxis?

Fitzgerald, B., & Howcroft, D. (1998). Towards dissolution of the IS [Information Systems] research debate: From polarization to polarity. *Journal of Information Technology*, *13*(4), 313-326.

https://link.springer.com/content/pdf/10.1057/jit.1998.9.pdf

(P. O'Sitivist)   (Ethna O'Graphy)

- positivist v. interpretivist
- realist v. relativist
- objectivist v. subjectivist
- emic/insider/subjective v. etic/outsider/objective
- quantitative v. qualitative
- exploratory v. confirmatory
- induction v. deduction
- field v. laboratory
- idiographic v. nomothetic
- relevance v. rigour

(Fitzgeral & Howcroft 1998, p. 318)

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'Soft' v. 'Hard' dichotomy

ONTOLOGICAL LEVEL (what is out there to know about)

Relativist
Belief that multiple realities exist as subjective construc-
tions of the mind. Socially-transmitted terms direct how
reality is perceived and this will vary across different
languages and cultures

Realist
Belief that external world consists of pre-existing hard,
tangible structures which exist independently of an
individual's cognition

EPISTEMOLOGICAL LEVEL (what and how can we know about it)

Interpretivist
No universal truth. Understand and interpret from
research's own frame of reference. Uncommitted neutrality
impossible. Realism of context important
Subjectivist
Distinction between the researcher and research situation
is collapsed. Research findings emerge from the interaction
between researcher and research situation, and the values
and beliefs of the researcher are central mediators
Emic/Insider/Subjective
Origins in anthropology. Research orientation centres on
native/insider's view, with the latter viewed as an appro-
priate judge of adequacy of research

Positivist
Belief that world conforms to fixed laws of causation
Complexity can be tackled by reductionism. Emphasis on
objectivity, measurement and repeatability
Objectivist
Both possible and essential that the researcher remain
detached from the research situation. Neutral observation
of reality must take place in the absence of any contami-
nating values or biases on the part of the researcher
Etic/Outsider/Objective
Origins in anthropology. Research orientation of outside
researcher who is seen as objective and the appropriate
analyst of research

(Fitzgeral & Howcroft 1998, p. 319)

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'Soft' v. 'Hard' dichotomy

METHODOLOGICAL LEVEL

Qualitative
Determining what things exist rather than how many there are. Thick description. Less structured and more responsive to needs and nature of research situation

Exploratory
Concerned with discovering patterns in research data and to explain/understand them. Lays basic descriptive foundation. May lead to *generation* of hypotheses

Induction
Begins with specific instances which are used to arrive at overall generalizations which can be expected on the balance of probability. New evidence may cause conclusions to be revised. Criticized by many philosophers of science, but plays an important role in theory/hypothesis conception

Field
Emphasis on realism of context in natural situation, but precision in control of variables and behaviour measurement cannot be achieved

Idiographic
Individual-centred perspective which uses naturalistic contexts and qualitative methods to recognize unique experience of the subject

Quantitative
Use of mathematical and statistical techniques to identify facts and causal relationships. Samples can be larger and more representative. Results can be generalized to larger populations within known limits of error

Confirmatory
Concerned with hypothesis testing and theory verification. Tends to follow positivist, quantitative modes of research

Deduction
Uses general results to ascribe properties to specific instances. An argument is valid if it is impossible for the conclusions to be false if the premises are true. Associated with theory verification/falsifaction and hypothesis testing

Laboratory
Precise measurement and control of variables, but at expense of naturalness of situation, since real-world intensity and variation may not be achievable

Nomothetic
Group-centred perspective using controlled environments and quantitative methods to establish general laws

(Fitzgeral & Howcroft 1998, p. 319)

'Soft' v. 'Hard' dichotomy

AXIOLOGICAL LEVEL (what is of value)

Relevance
External validity of actual research question and its relevance to practice is emphasized, rather than constraining the focus to that researchable by 'rigorous' methods

Rigour
Research characterized by hypothetico-deductive testing according to the positivist paradigm, with emphasis on internal validity through tight experimental control and quantitative techniques

(Fitzgeral & Howcroft 1998, p. 319)

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Positioning strategies

	Strategy	Problem
Supremacism	*one research paradigm as universally applicable and 'best' in all situations*	*there is no single research question that has been answered unequivocally to date in the field* (information systems)
Isolationism	*treat each paradigm as incommensurable and operate strictly according to a particular paradigm, ignoring other alternatives*	*complementary insights are provided by the application of different research paradigms*
Integrationism	*integrate alternative approaches into a single coherent mode of analysis*	*presumes the existence of some Archimedean point of vantage from which the coherence and suitability of any proposed integrated approach may be judged*
Pluralism	*allow for a contingent toolbox approach where different methods with complementary strengths could be used a appropriate*	*there is little to prevent a pluralist strategy from descending into anarchy*

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(Fitzgeral & Howcroft 1998, p. 320-322)

"Towards dissolution of the IS research debate: from <u>polarization to polarity</u>"

'Soft' v. 'Hard'

Systems development praxis

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