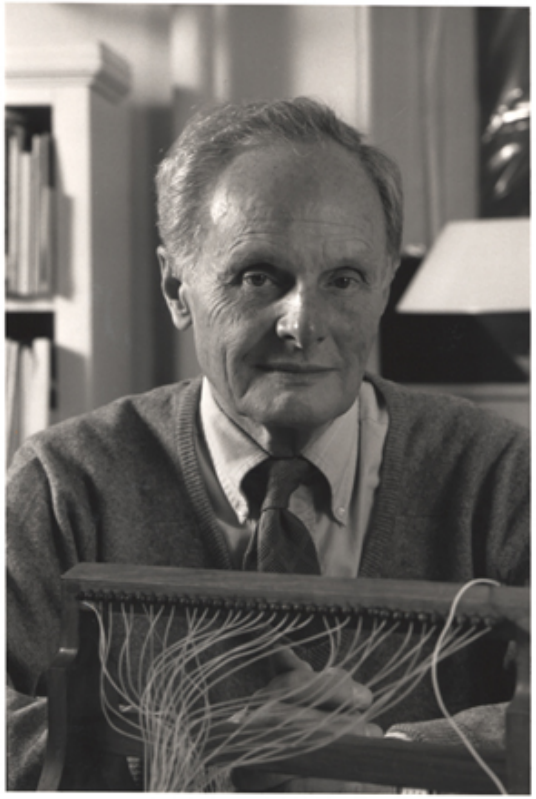
Systems Approach

An attempt to compromise Hughes systems approach



Karel Mulder

January 7, 2010

TU Delft
Delft University of Technology

Systems approach

Innovation is to be described as systems creation and systems change

> i.e. artifacts are connected. It is crucial to recognize that the state, or activity, of one component influences the state, or activity, of other components in the system

Systems approach

A system is constituted of related parts or components. These components are connected.

- Often centrally controlled.
- Limits established by the extent of this control.
- Optimize the system's performance.
- Direct the system toward the achievement of goals.

Systems approach

Systems reflect and influence their context, but they also develop an internal dynamic

systems dynamics vs. construction

Systems approach

Phases of systems development

Invention-development

Inventor-Entrepreneur

Transfer

Organizers, financiers

Systems growth

Institutionalization

Momentum

‘systems culture’

Systems approach

Systems growth

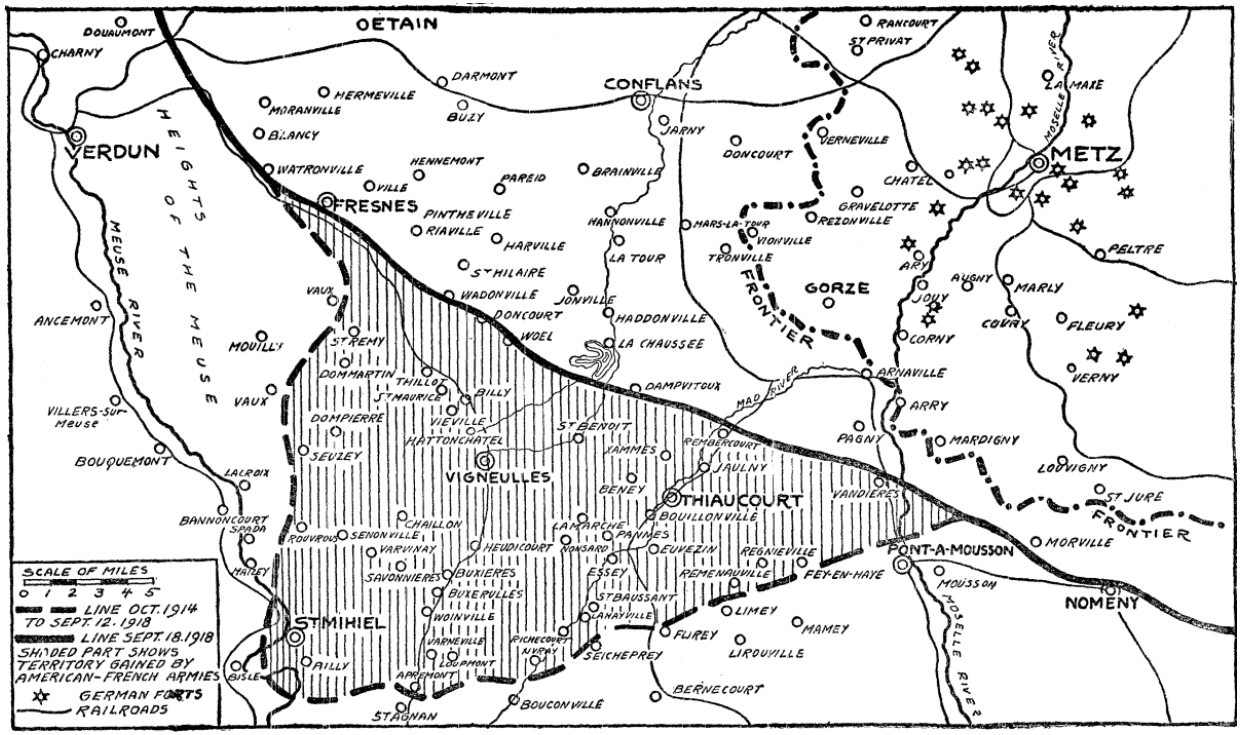
Momentum: mass, velocity, direction

(capital, specific skills, culture)

Reverse salient, critical problems

Systems approach

Reverse Salient



http://www.gutenberg.org/files/16513/16513-h/images/map-261.png

A reverse salient is a part of the system that is falling behind in its development, like in a front line

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Systems approach

Reverse Salient

A reverse salient is a vaguely defined set of nuisances that hamper the system in its development.

It might be interpreted differently by various actors.

e.g. traffic congestion

http://www.common-sense.com/Members/john/content/gridlock_468x312.jpg

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Systems approach

Reverse Salient

A reverse salient might be slumbering or critical

The systems innovative capabilities are directed towards the reverse salient

To attack them successfully, reverse salients have to be reformulated as ‘critical problems’

(a “plan of attack”)

Systems approach

Critical Problem

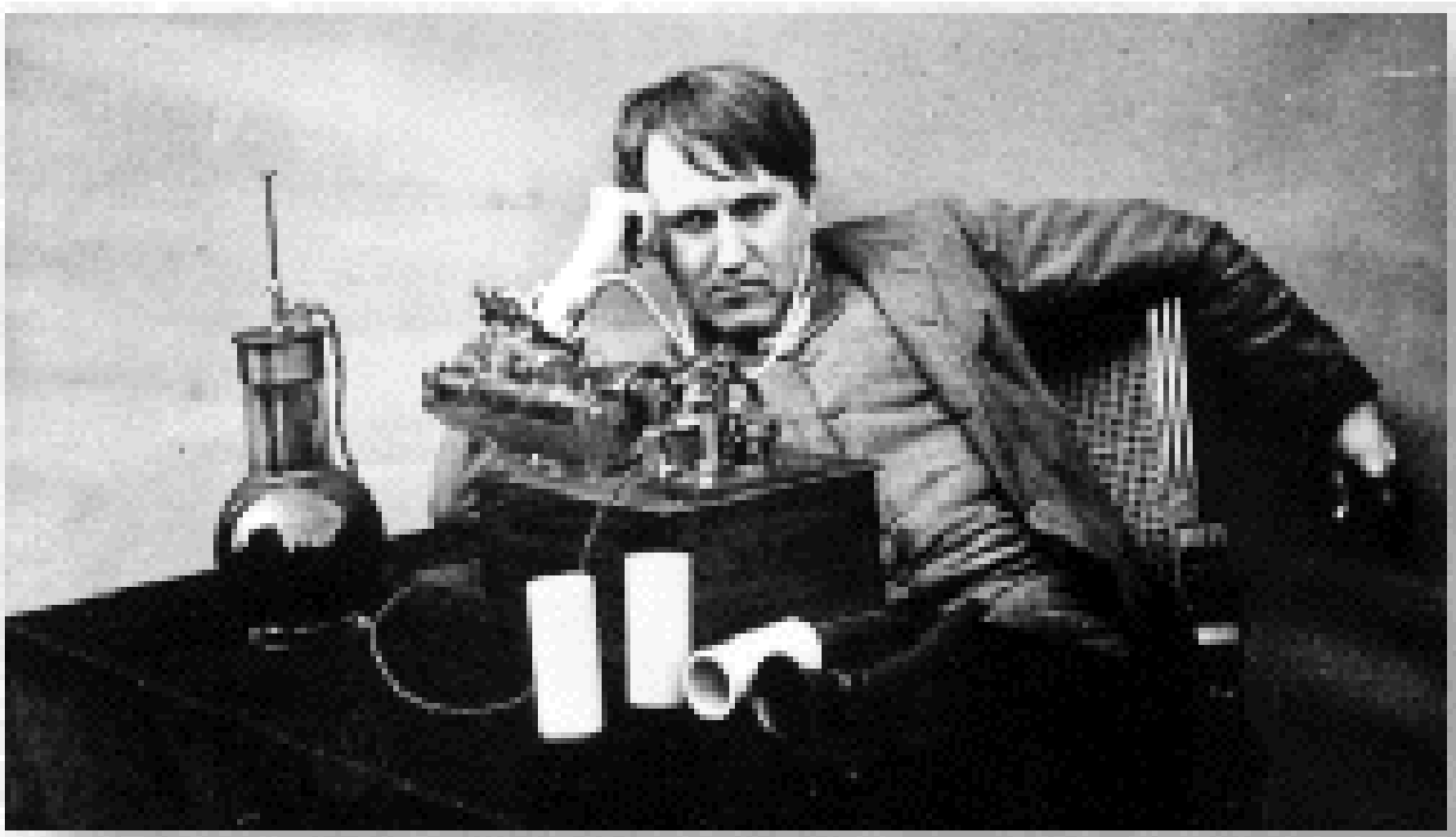
Reformulation of problem in do-able terms

More than one translation R.S. – C.P.

Translation involves creativity

A good translation greatly increases the likelihood of a solution

Failure to formulate critical problem might stimulate alternative systems



Edison

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Menlo Park

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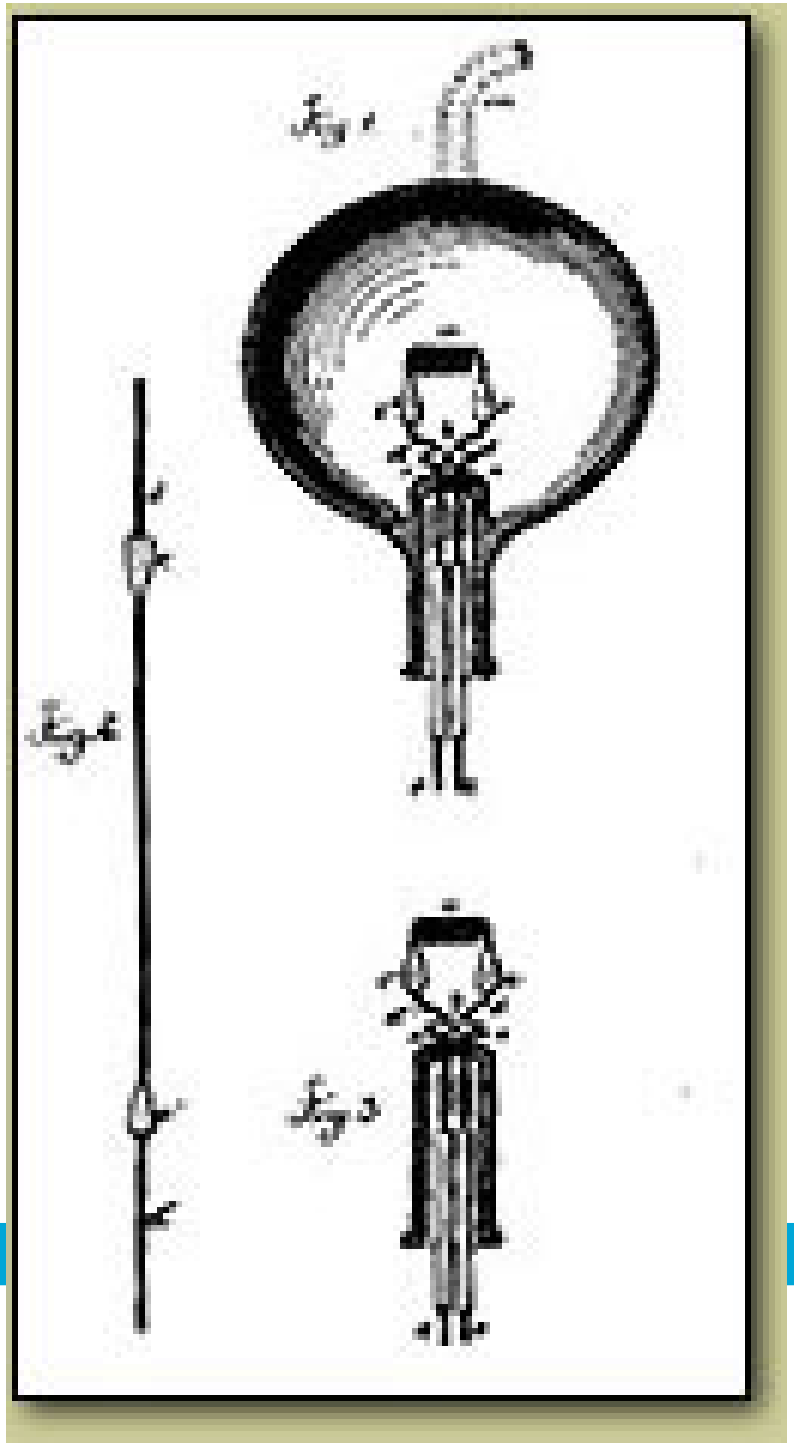

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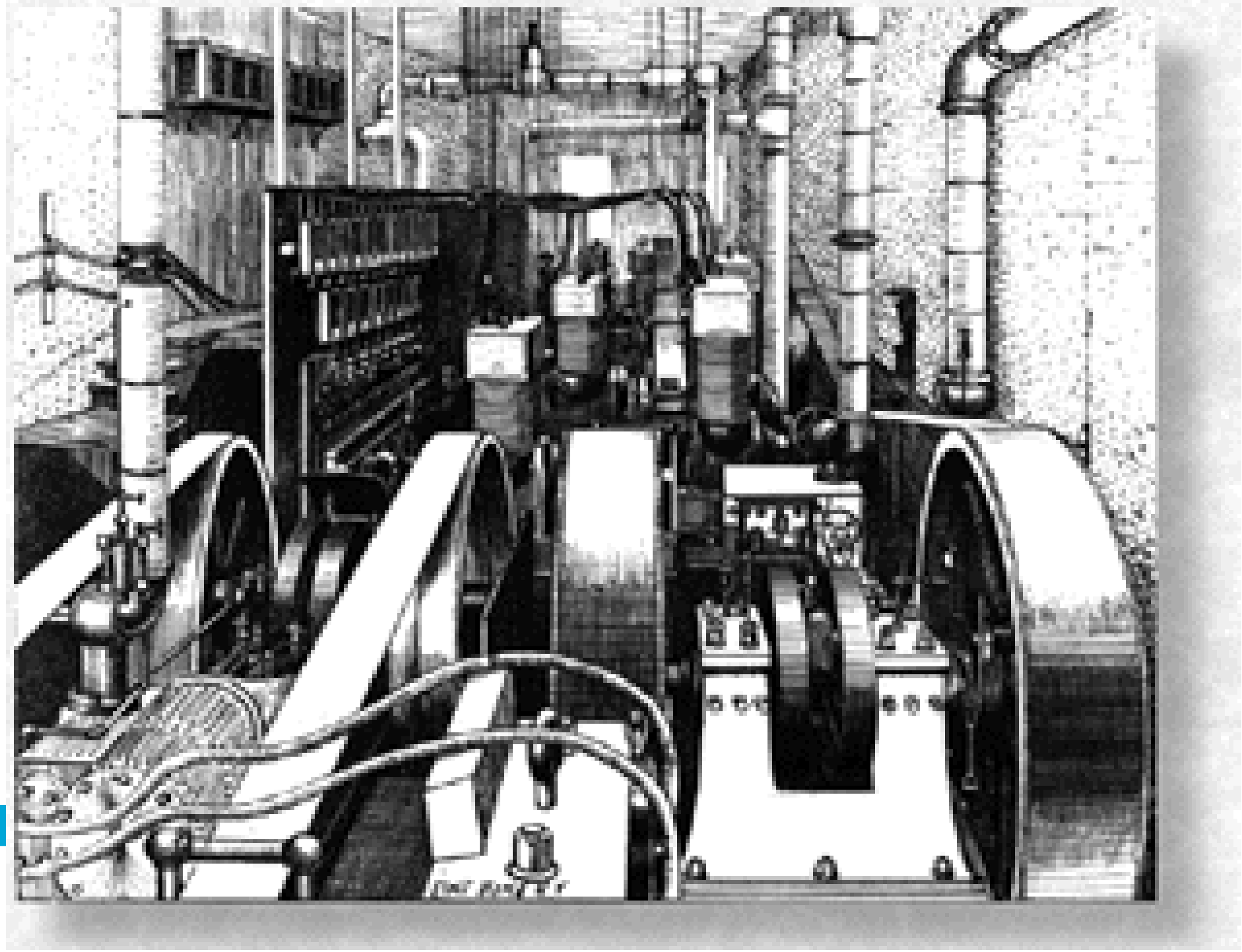

Systems approach

Reverse Salient and Critical Problem, example

Reverse Salient:

- Edison could only supply down town areas with DC

Critical problem

- Better transmission
- Cost efficient small scale power stations

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Systems approach

Reverse Salient and Critical Problem, example

Critical problem:

- Higher voltage for transmission
- Distribution at lower voltages
- Westinghouse

- Battle of systems
  - Electric chair

Systems approach

Reverse Salient and Critical Problem, example

1886 - AC technology, developed by Westinghouse.

1887 - Edison conducts demonstration in West Orange, New Jersey.

1887 - Edison publishes pamphlet A Warning, comparing AC and DC, including of AC victims.

1888, June 4 - New York establishing electrocution as the state's method of execution.

1888, December 13 - Westinghouse writes letter in NY Times

1889, March 29 - William Kemler kills his lover with an axe in Buffalo, New York.

1989, May - William Kemmler is sentenced to death.

1889 - 1890 - Westinghouse funds appeals for Kemmler. Edison and Brown are witnesses for the state.

Systems approach

Reverse Salient and Critical Problem, example

1890, August 6 - Kemmler is executed in the electric chair. Kemmler does not die until the current is fired up a second time.

George Fell, executioner's assistance to first electrocution - "The man never suffered a bit of pain!"

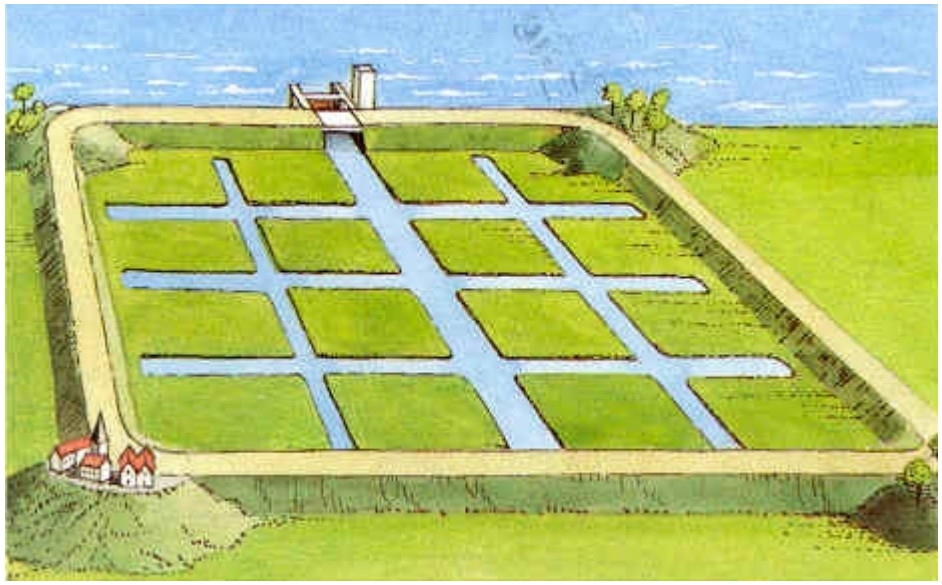
Alfred P. Southwick - "We live in a higher civilization from this day on."

New York Herald - "Strong men fainted and fell like logs on the floor."

George Westinghouse - "They would have done better with an axe."

Dutch Polders as Systems

- Combination of:
  - Canals
  - Locks
  - personnel
  - Levies
  - Combinations of Pumping stations
  - Maintenance and emergencies organization
  - Taxation system
  - Decision making structure
  - Agricultural practices



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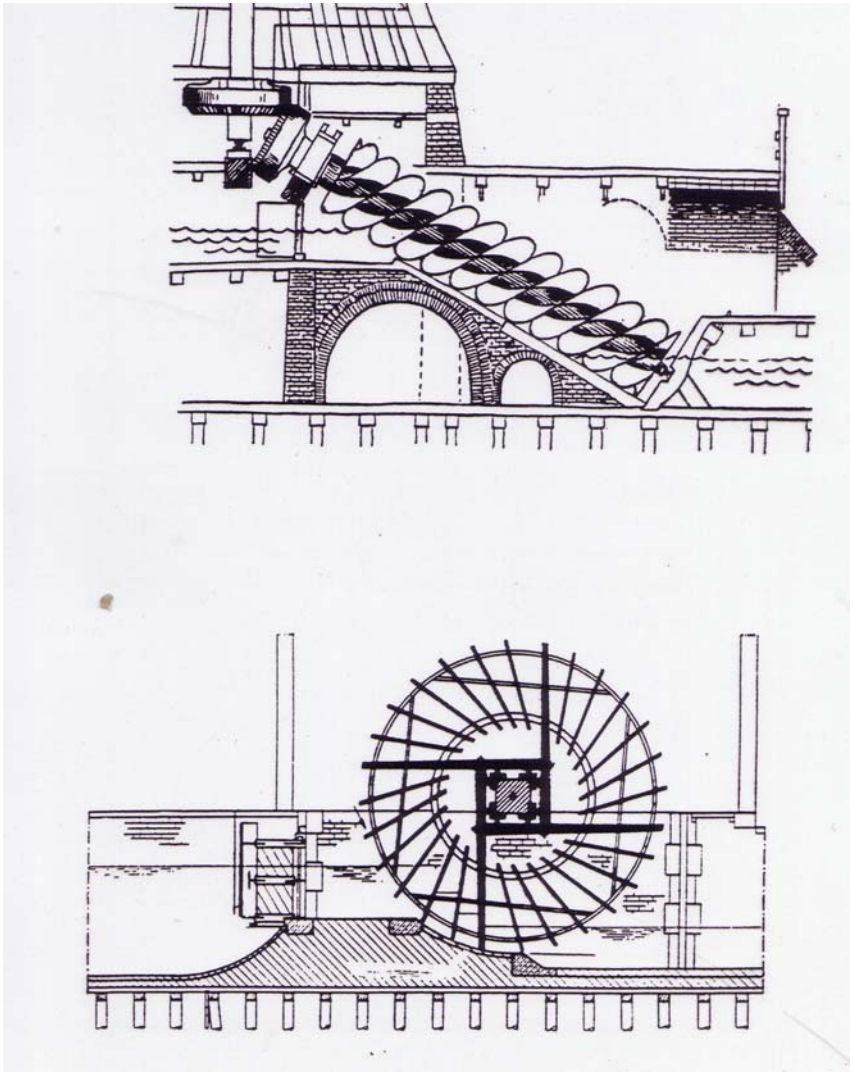
Pumping



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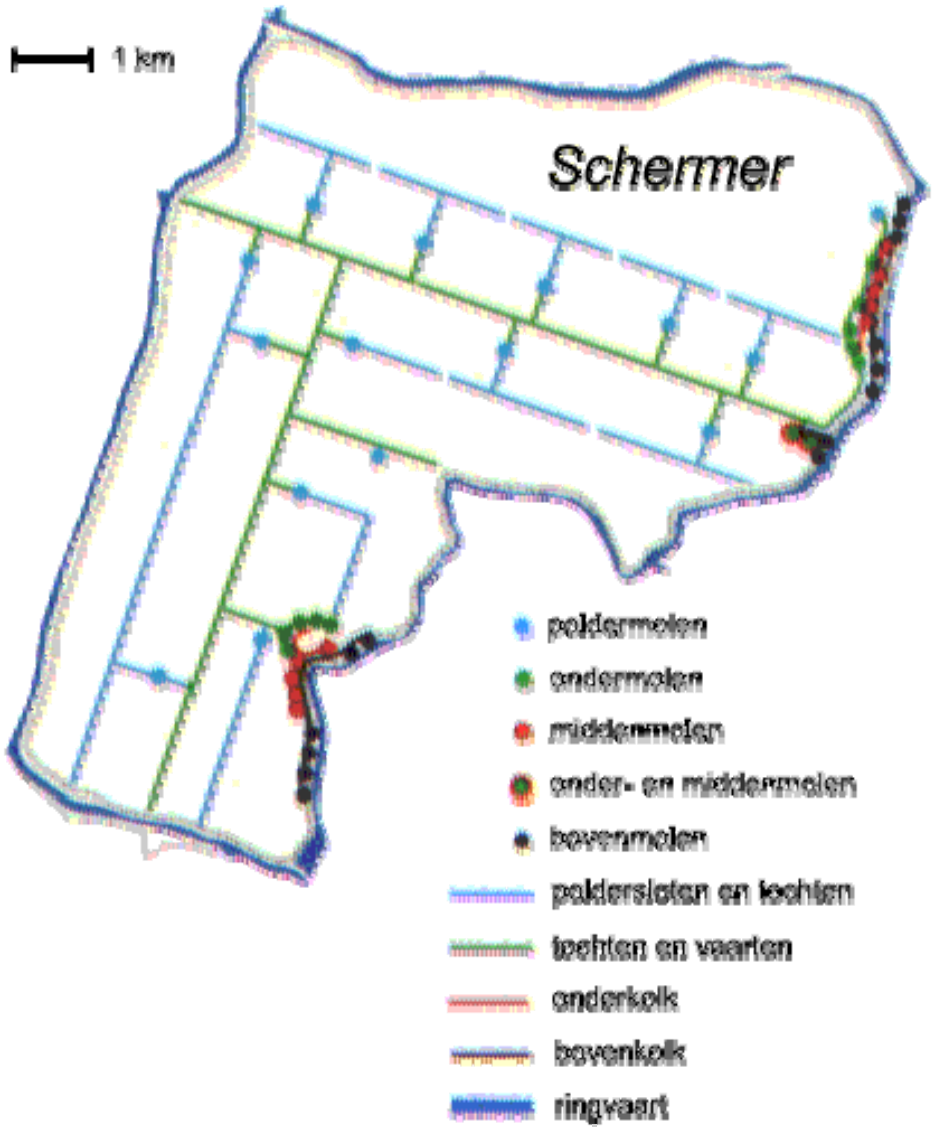
A wind mill polder system



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Reverse Salient, 19th century

- Lack of control of water level
- (needed for higher agricultural yields)
- Labor conditions/vulnerability for strikes by windmill operators

Critical problem: introduction of mechanical pumping

Barrier: availability of energy/transport

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Cultural resistance

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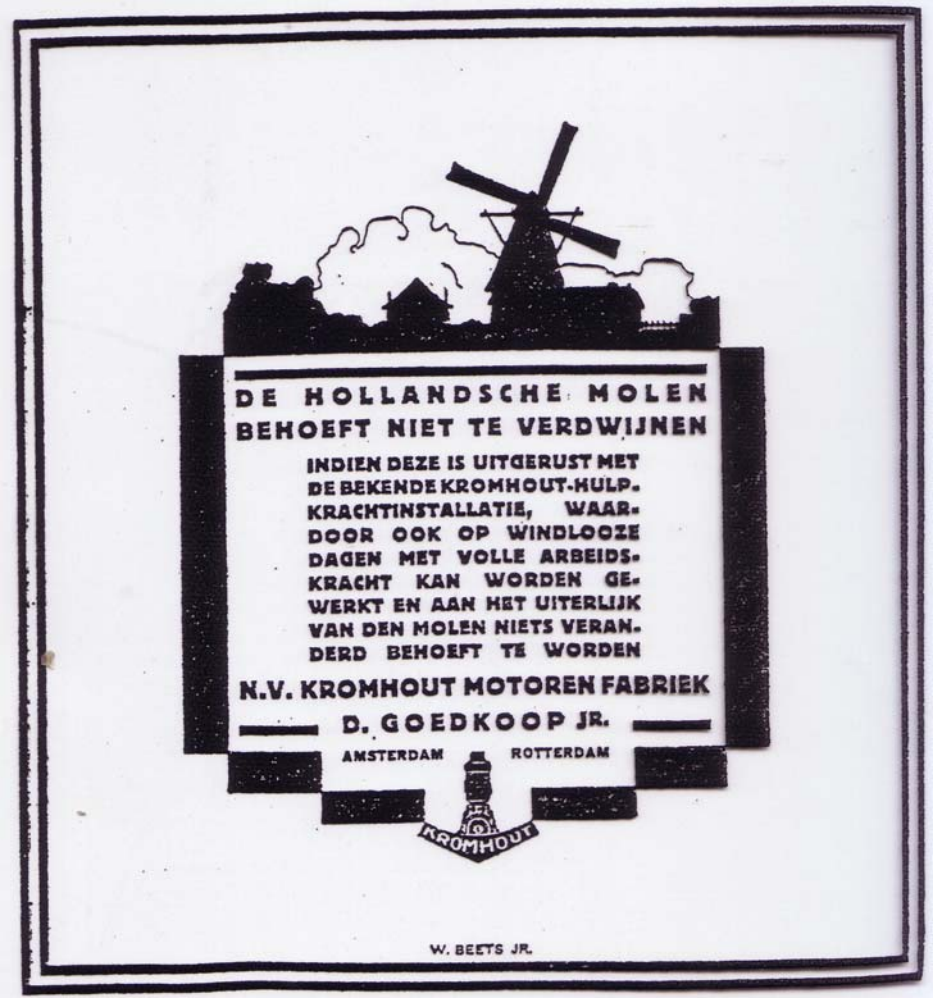
New critical problems

1: auxiliary power for windmills



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Windmill Innovation

1. Wing improvement

2. Dual use: pumping and electricity production

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Failure of critical problems

Declining prices of energy

Rising labor costs

Failure in a crucial experiment, 1968

Escape route: “Cold war”: BWO

Conclusion: Systems

Combines Constructivist and autonomous elements

Centrally Controlled?: Various public-private combinations

Growing complexity:

- Multi Functional systems
- Coupled Systems