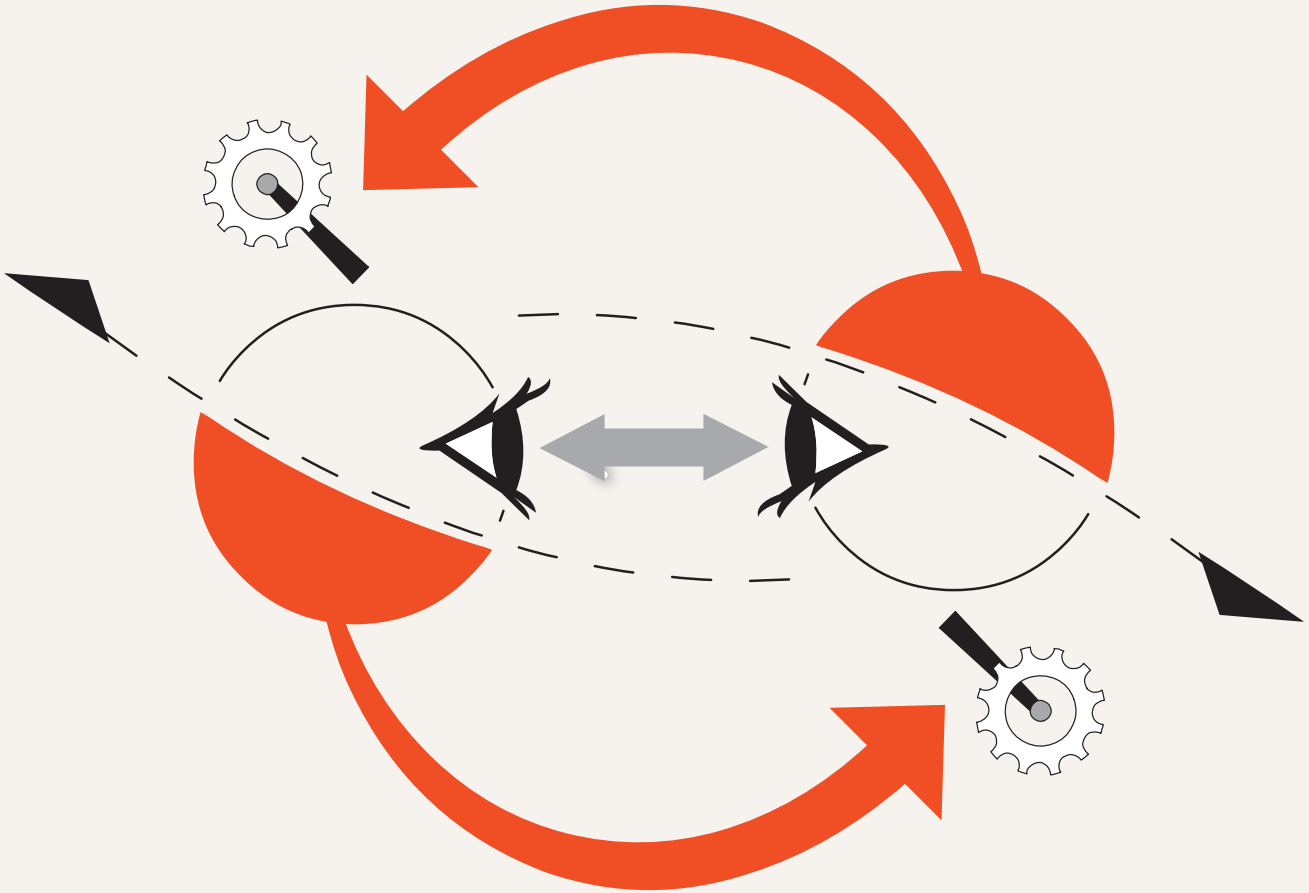
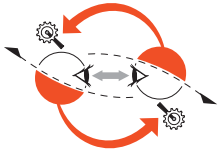
CYBERNETICS CONVERSATION DESIGN



CONVERSATION



cybernetics reviewed

Gordon Pask

double-loop architectures

conversation theory

applications

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CYBERNETICS

OR CONTROL AND COMMUNICATION IN THE ANIMAL AND THE MACHINE

Norbert Wiener

PROFESSOR OF MATHEMATICS
THE MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

THE TECHNOLOGY PRESS

JOHN WILEY & SONS, INC., NEW YORK

HERMANN et CIE, PARIS

CYBERNETICS

CIRCULAR CAUSAL AND FEEDBACK MECHANISMS IN BIOLOGICAL AND SOCIAL SYSTEMS

Transactions of the Tenth Conference
April 22, 23, and 24, 1953, Princeton, N. J.

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* This is the final conference.
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JANET FREED LYNCH, *Assistant for the Conference Program*

† Absent.

all from "soft sciences"

communication and regulation

in

goal-directed systems,
organic or constructed

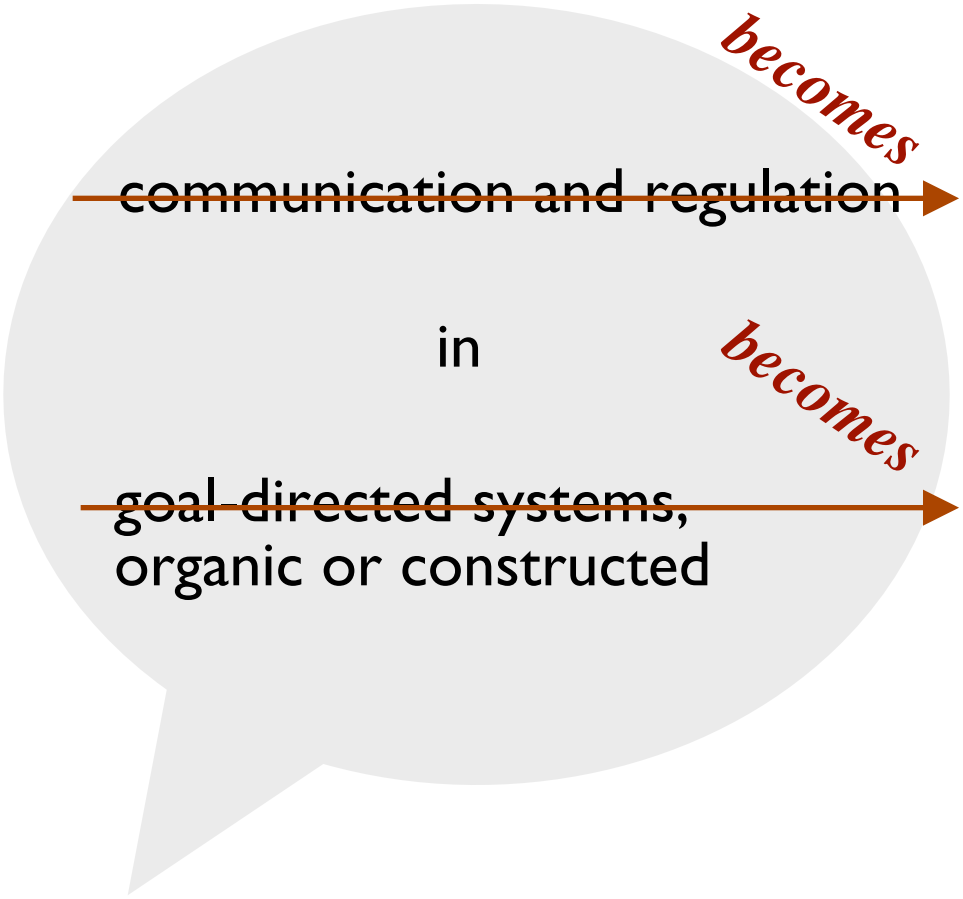
first-order cybernetics

communication and regulation

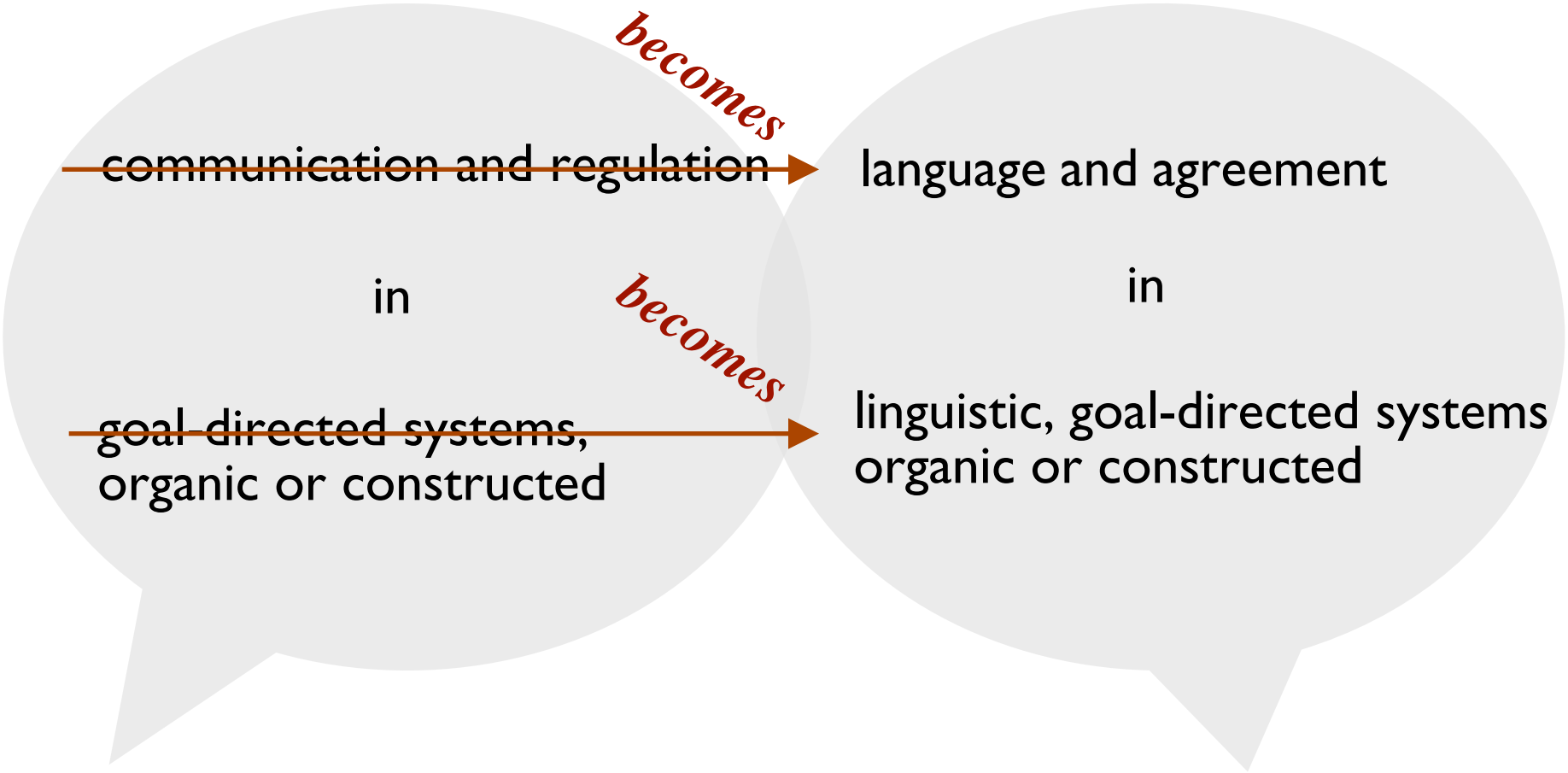
in

goal-directed systems,
organic or constructed

first-order cybernetics



first-order cybernetics



first-order cybernetics

communication and regulation

in

goal-directed systems,
organic or constructed

first-order cybernetics

language and agreement

in

linguistic, goal-directed systems
organic or constructed

second-order cybernetics

communication and regulation

in

goal-directed systems,
organic or constructed

language and agreement

in

linguistic, goal-directed systems
organic or constructed

science of
observed systems

science of
observing systems

CYBERNETICS

system has goal

system aims toward goal

environment affects aim

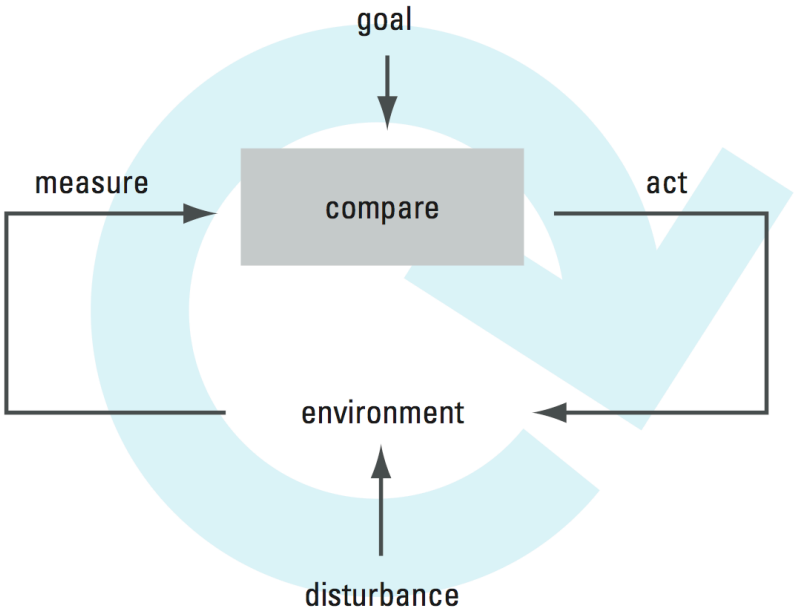
information returns to system—'feedback'

system measures difference between state and goal
—detects 'error'

system acts to correct the error, to achieve its goal

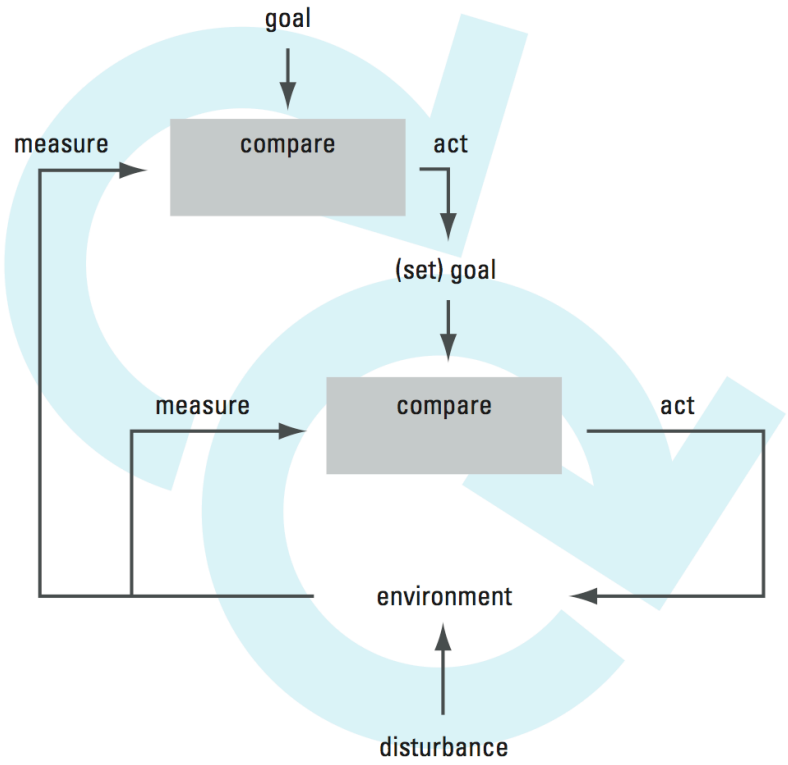
first-order cybernetics

cybernetics explains how
circular causal systems work — single loop

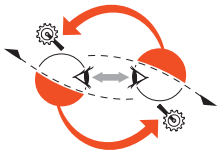


double-loop systems

cybernetics explains how
circular causal systems work—
even when they self-regulate and modify their goals.



CONVERSATION



cybernetics reviewed

Gordon Pask

double-loop architectures

conversation theory

applications

concepts

double-loop interaction

uncertainty regulation in learning

conceptual learning style

coherence & the kinetics of thinking

entailment meshes

architecture of conversation

consciousness is conserved

Review Papers by Gordon Pask/Relatively Accessible

These materials are offered with the desire to make them available to the widest possible audience. The files are large PDFs with variable download times and variable visual quality. They may be searched using the usual "find" functions in PDF readers. Last updated April 19, 2011.

Details of Pask's cybernetic machines, Musicolour and Colloquy of Mobiles

"A Comment, A Case History, and a Plan", in Cybernetic Serendipity, J. Reichardt, (Ed.), Rapp. And Carroll, 1970. Reprinted in Cybernetics, Art and Ideas, Reichardt, J., (Ed.) Studio Vista, London, 1971, 76-99. (problem with prior PDF repaired on 30 December 2010)

Review of Pask's approach to conversation, its embodiment and representation

"The Limits of Togetherness", Proceedings, Invited Keynote address to IFIP, World Congress in Tokyo and Melbourne, Editor, S. Lavington. Amsterdam, New York, Oxford: North holland Pub. Co., 1980, 999-1012.

On the nature of goal-directed systems (Heinz von Foerster's favorite Pask paper)

"The meaning of cybernetics in the behavioural sciences", reprinted in Progress of Cybernetics, edited by J. Rose, 1969.

some major collaborators

Dionysius Kallikourdis

Bernard C. E. Scott

reliable reporters

Bernard C. E. Scott

Diana Laurillard

Usman Haque

Ranulph Glanville

The Architectural Relevance of Gordon Pask

Usman Haque reviews the contribution of Gordon Pask, the resident cybernetician on Cedric Price's Fun Palace. He describes why in the 21st century the work of this early proponent and practitioner of cybernetics has continued to grow in pertinence for architects and designers interested in interactivity.

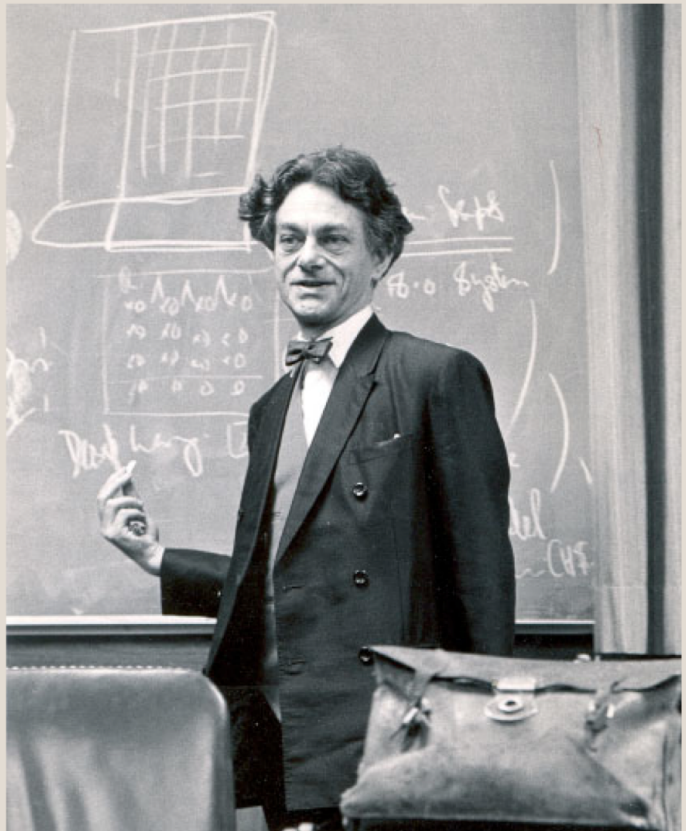
THE ARCHITECTURAL RELEVANCE OF CYBERNETICS

Gordon Pask

It is easy to argue that cybernetics is relevant to architecture in the same way that it is relevant to a host of other professions; medicine, engineering or law. PERT programming, for example, is unequivocally a 'cybernetic' technique and it is commonly employed in construction scheduling. Computer assisted design is a 'cybernetic' method and there are several instances of its application to architecture, (for example, the WSCC's planning scheme in which the designer uses a graphic display to represent the disposition of structural modules on a grid and in which the computer summarizes the cost effort consequences of a proposed layout). Of these cases the first (PERT programming) is a valuable but quite trivial

them, criticizing them and evaluating them (
in statements of stability or style). Indeed, w
interpreted, the body of metalinguistic stater
formed the theory of pure architecture.
Consequently, architects did not need to see
themselves as systems designers, even thoug
they designed systems, and the evidence sug
that they did not do so.[3] Instead the professi
image was that of a sophisticated house, coll
or theatre builder.

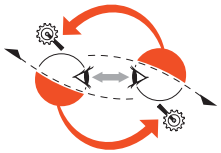
In the course of the Victorian era new techniques were developed too rapidly to be assimilated into pure architecture and new problems were posed and could no longer b
solved by applying the rules of pure architec
for example, make a 'railway station' or mak



CONVERSATION

cybernetics reviewed

Gordon Pask



double-loop architectures

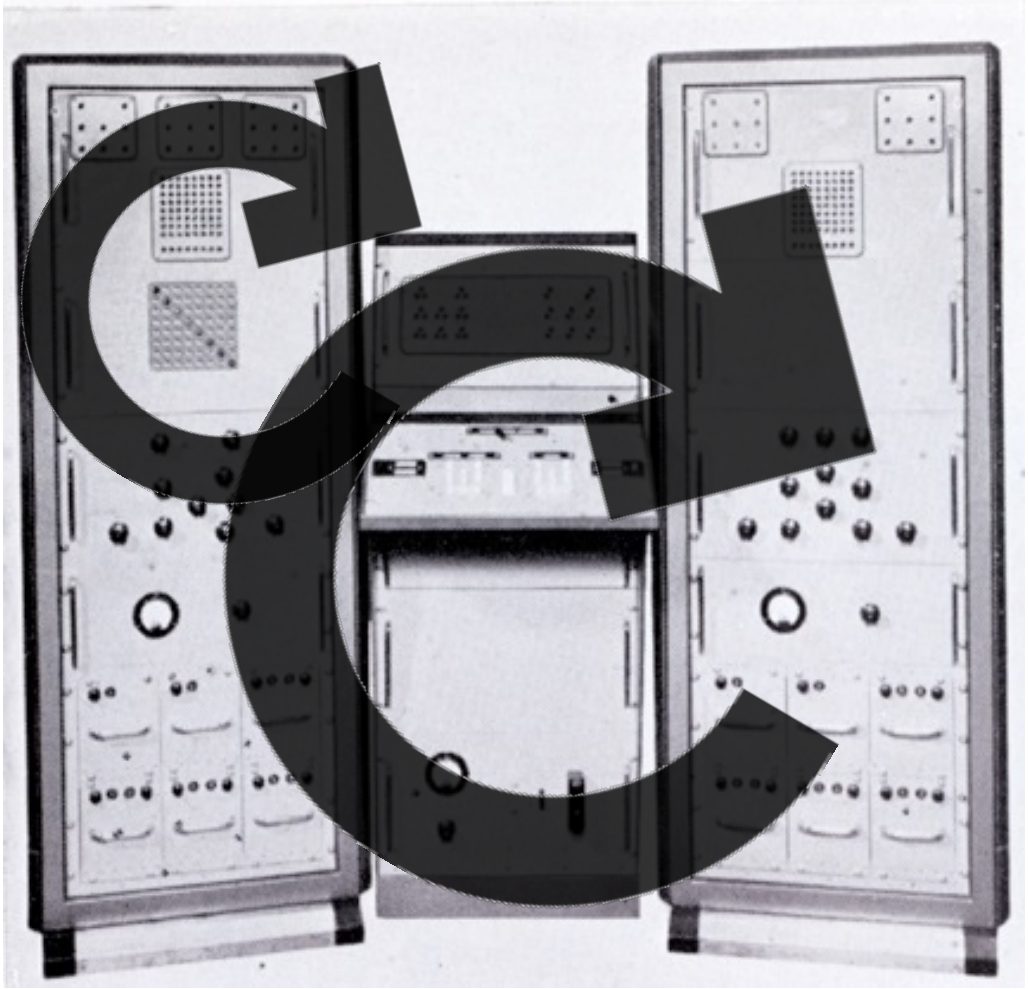
conversation theory

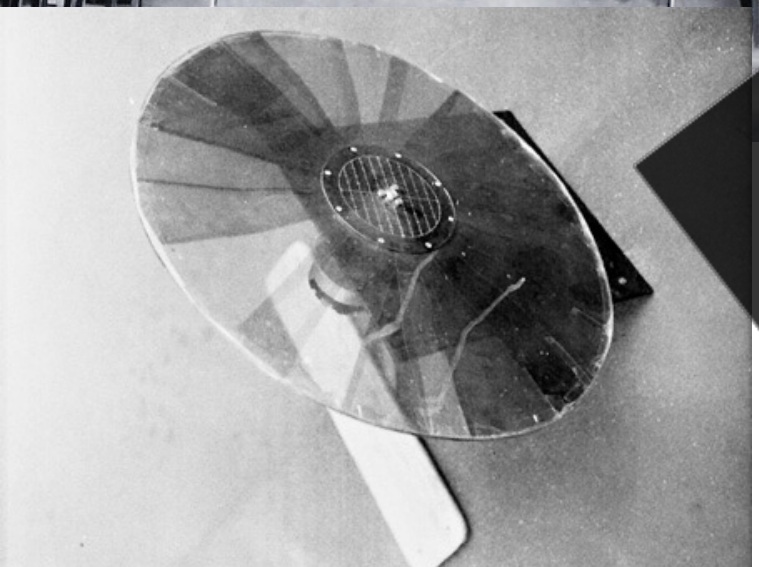
applications

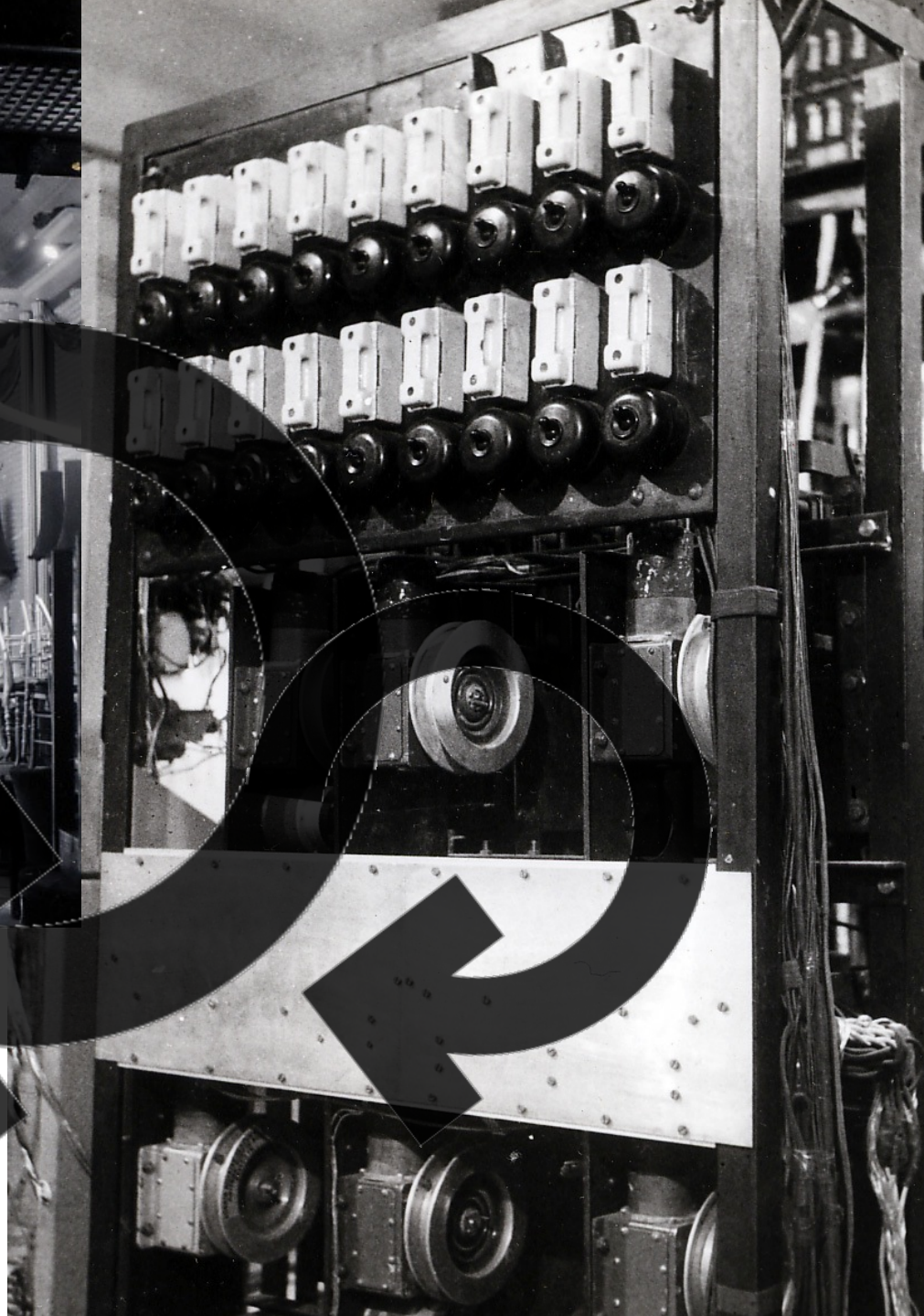
TEACHER SIMULATOR

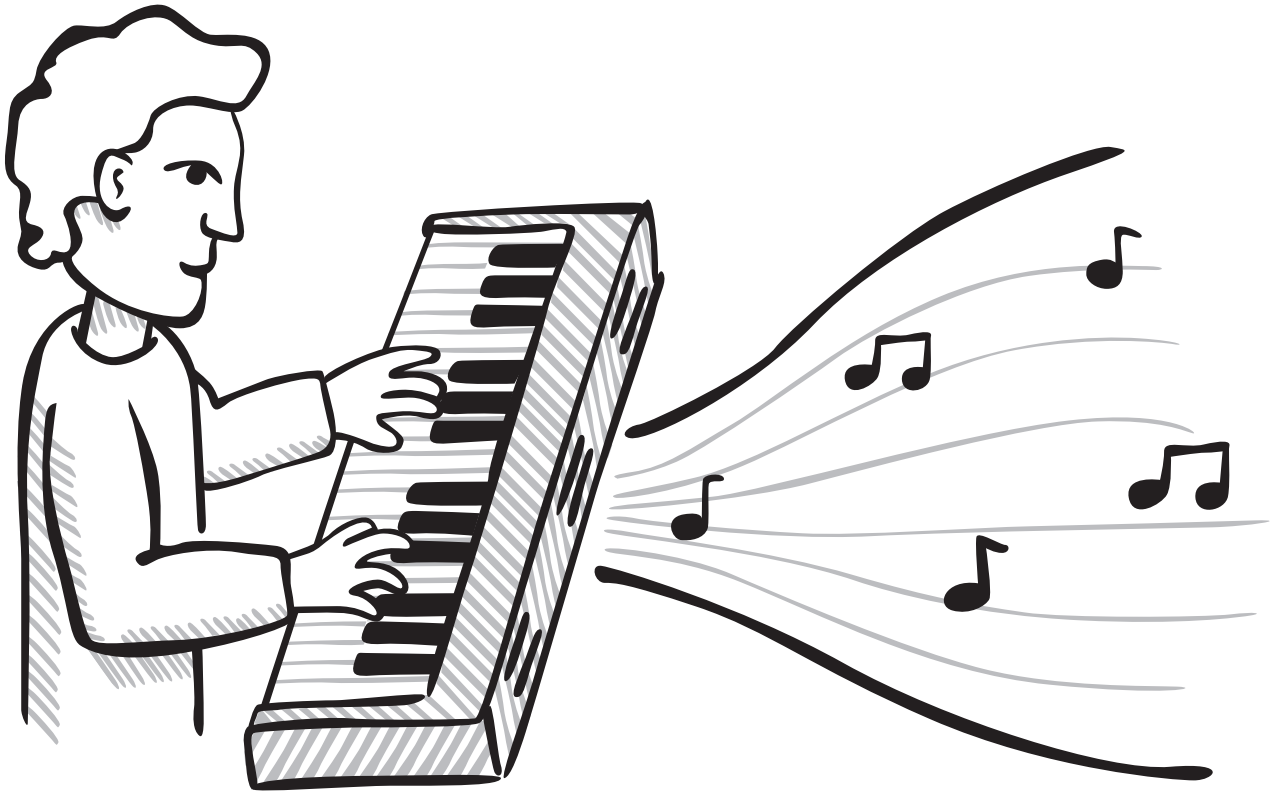
CONTROL CONSOLE

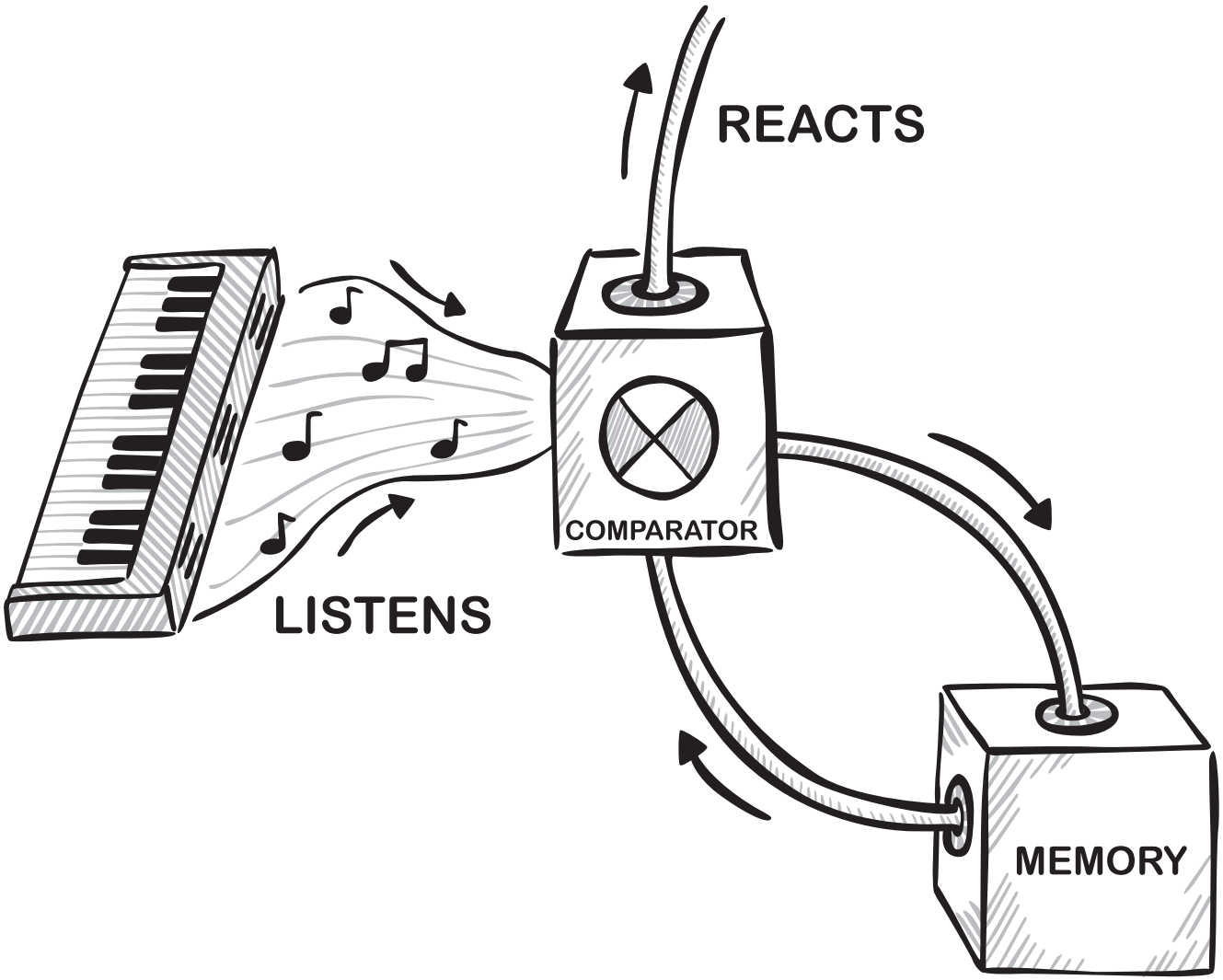
PUPIL SIMULATOR

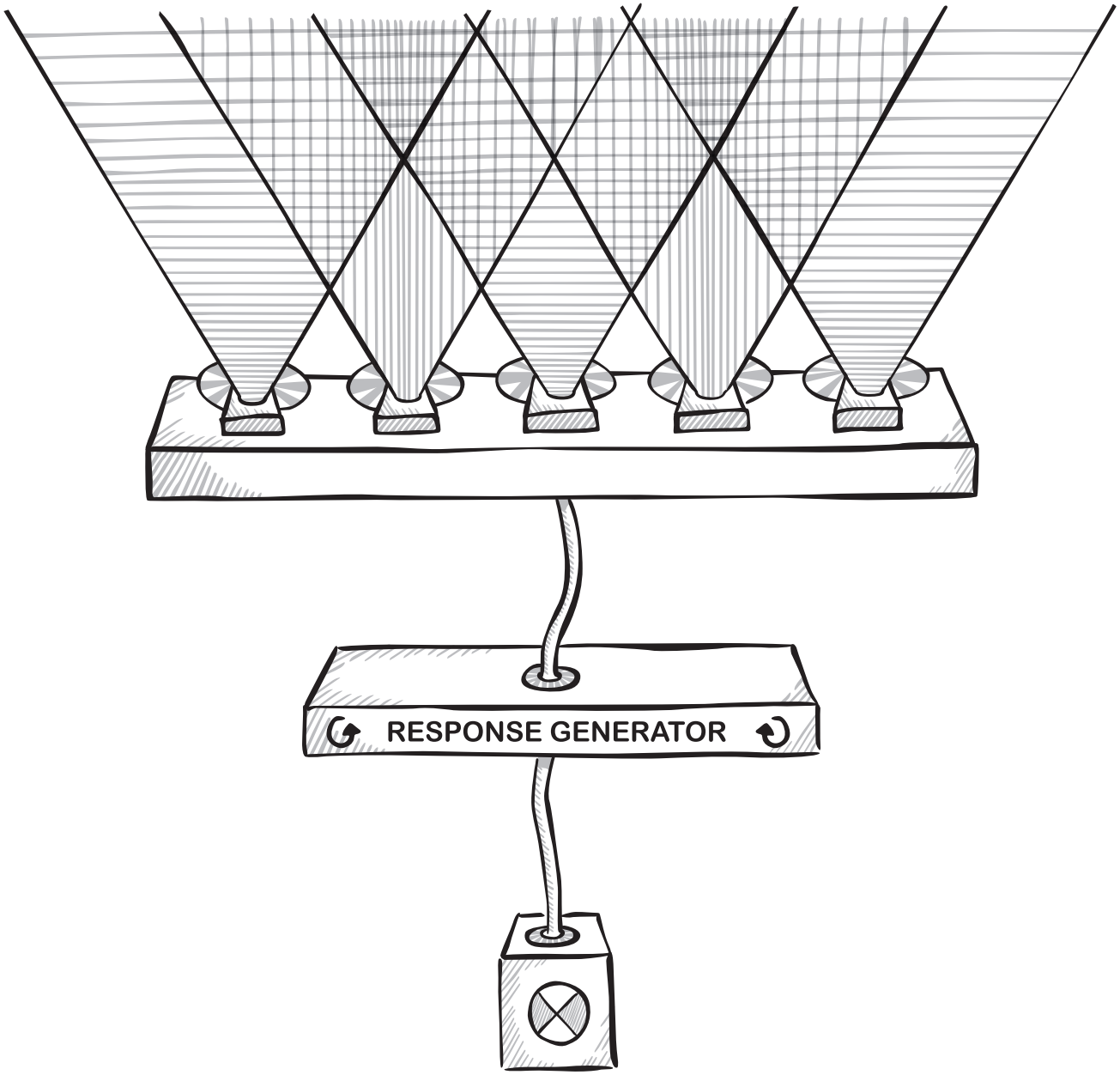


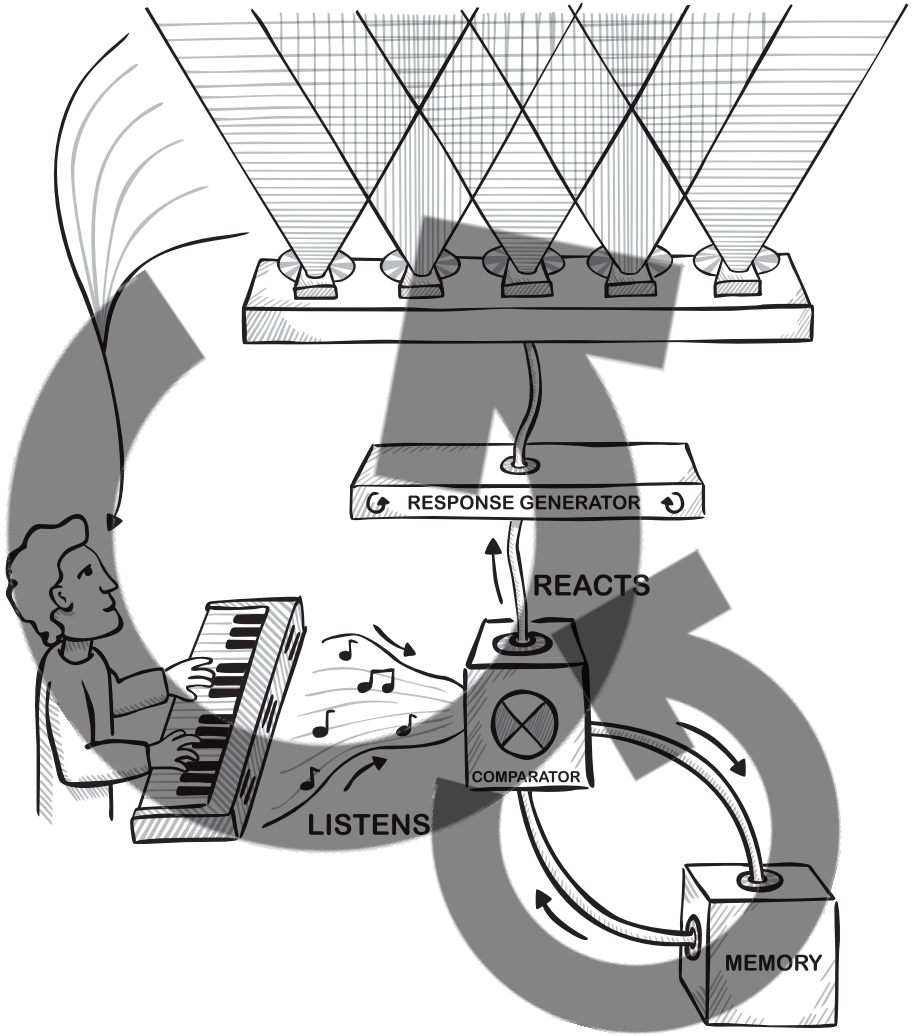







REACTS
COMPARATOR
LISTENS
MEMORY


RESPONSE GENERATOR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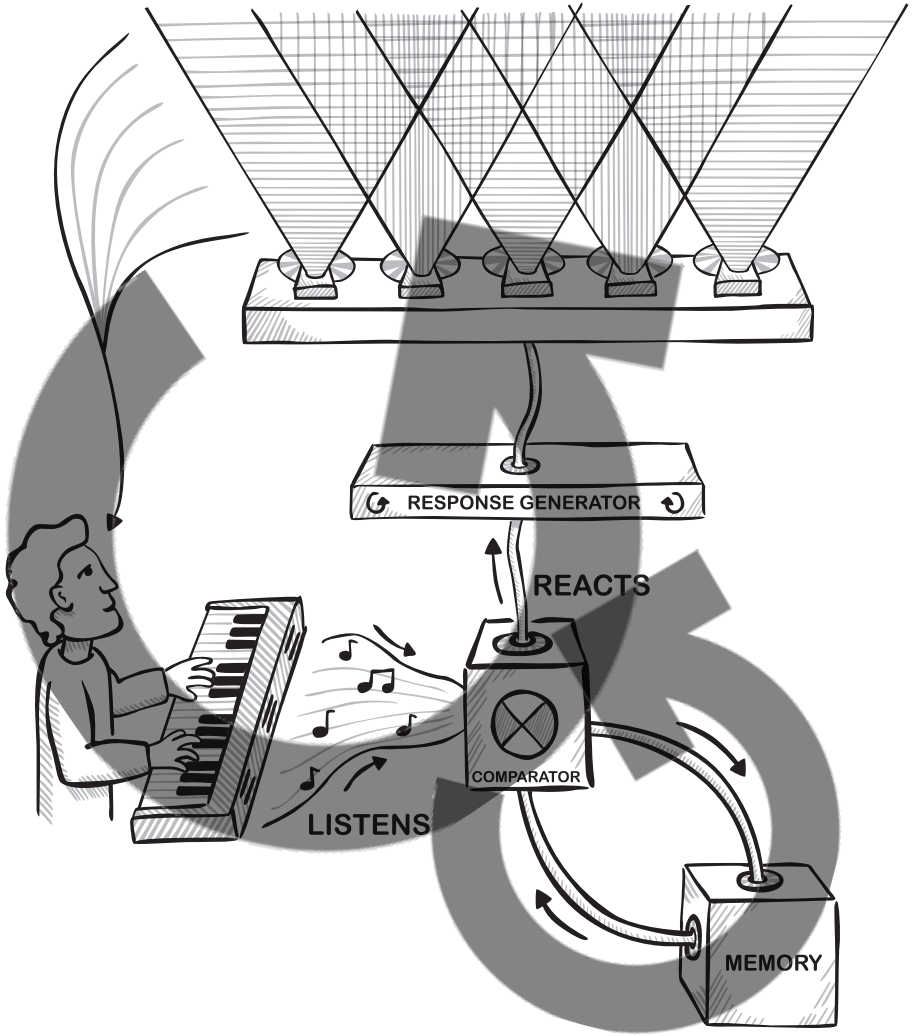
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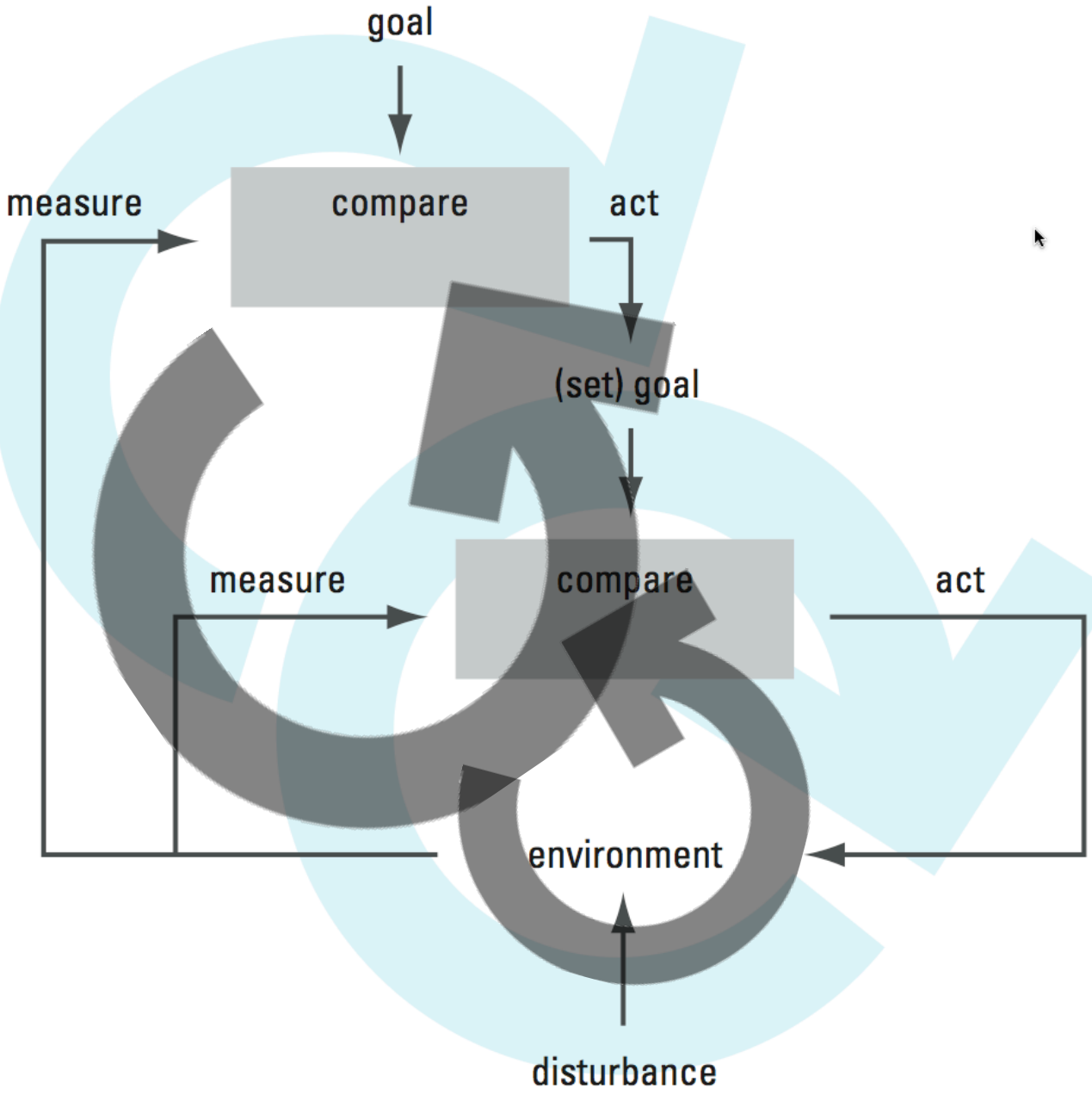
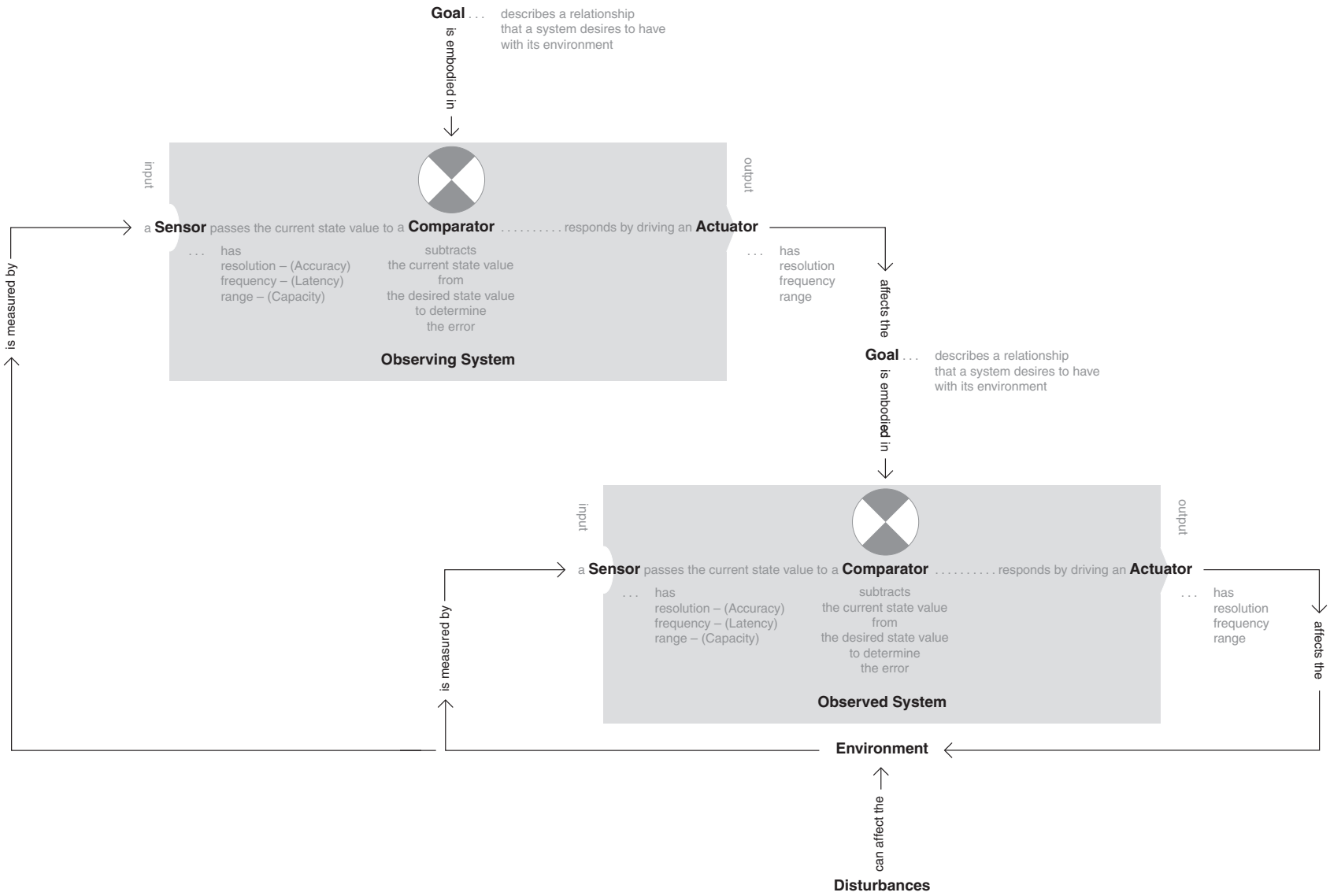
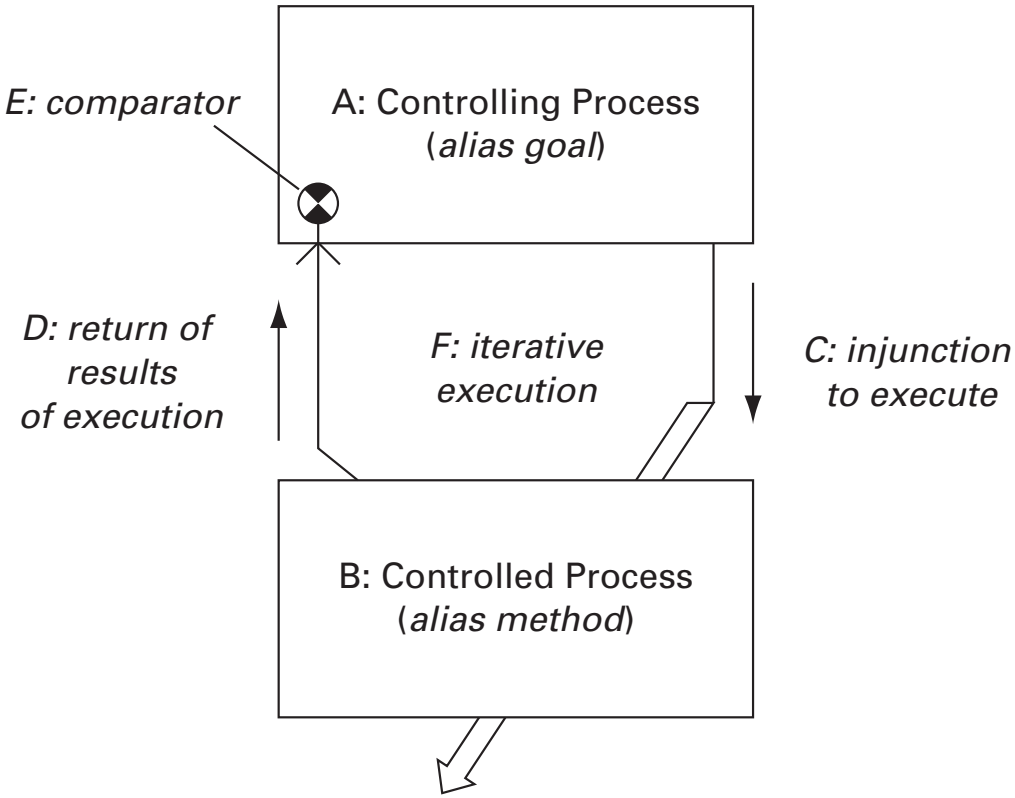

goal
measure
compare
act
(set) goal
measure
compare
act
environment
disturbance

Second-order Feedback: Formal Mechanism

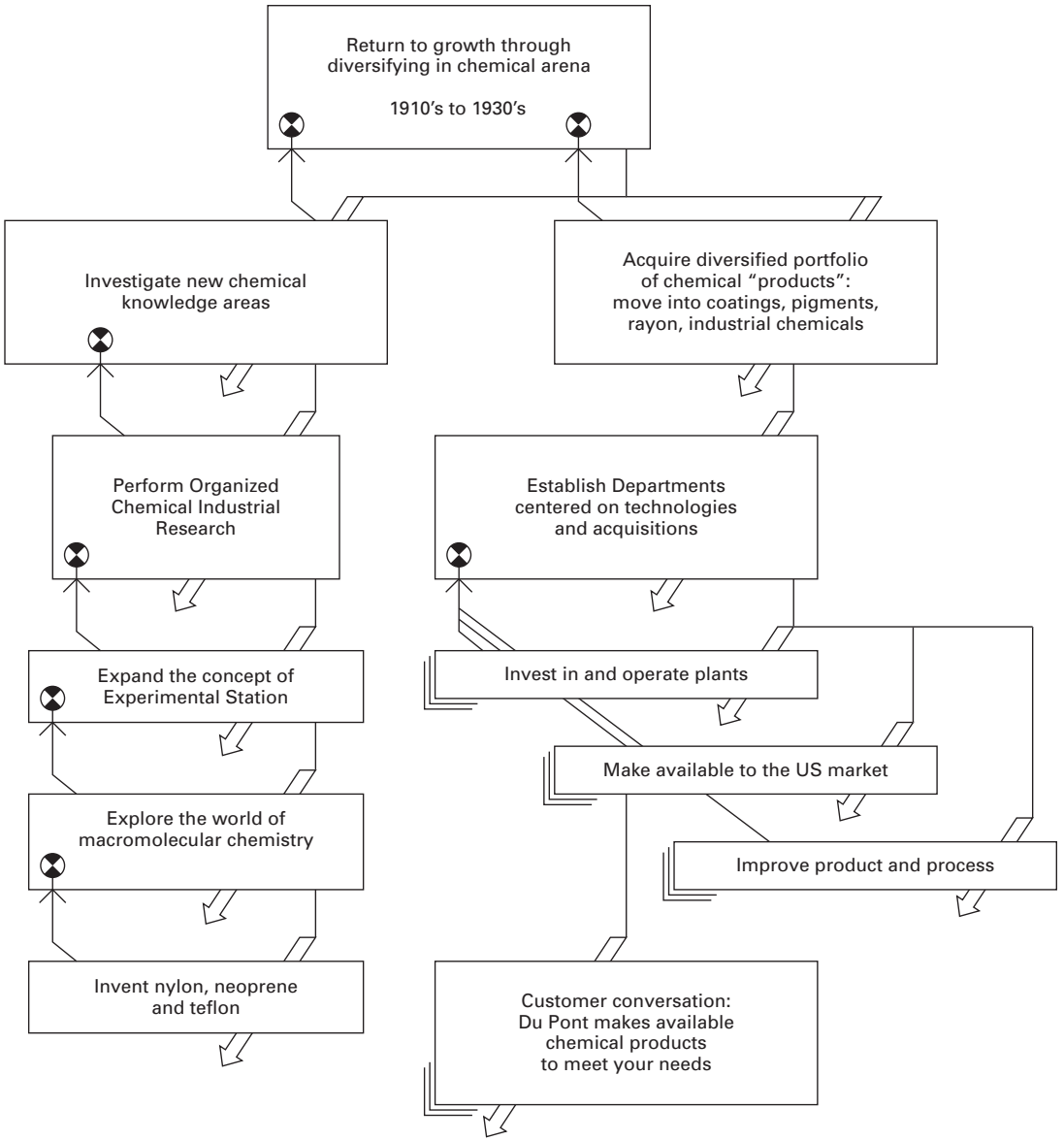
An automatic feedback system (first-order) is controlled by another automatic feedback system (second-order). The first system is 'nested' inside the second.

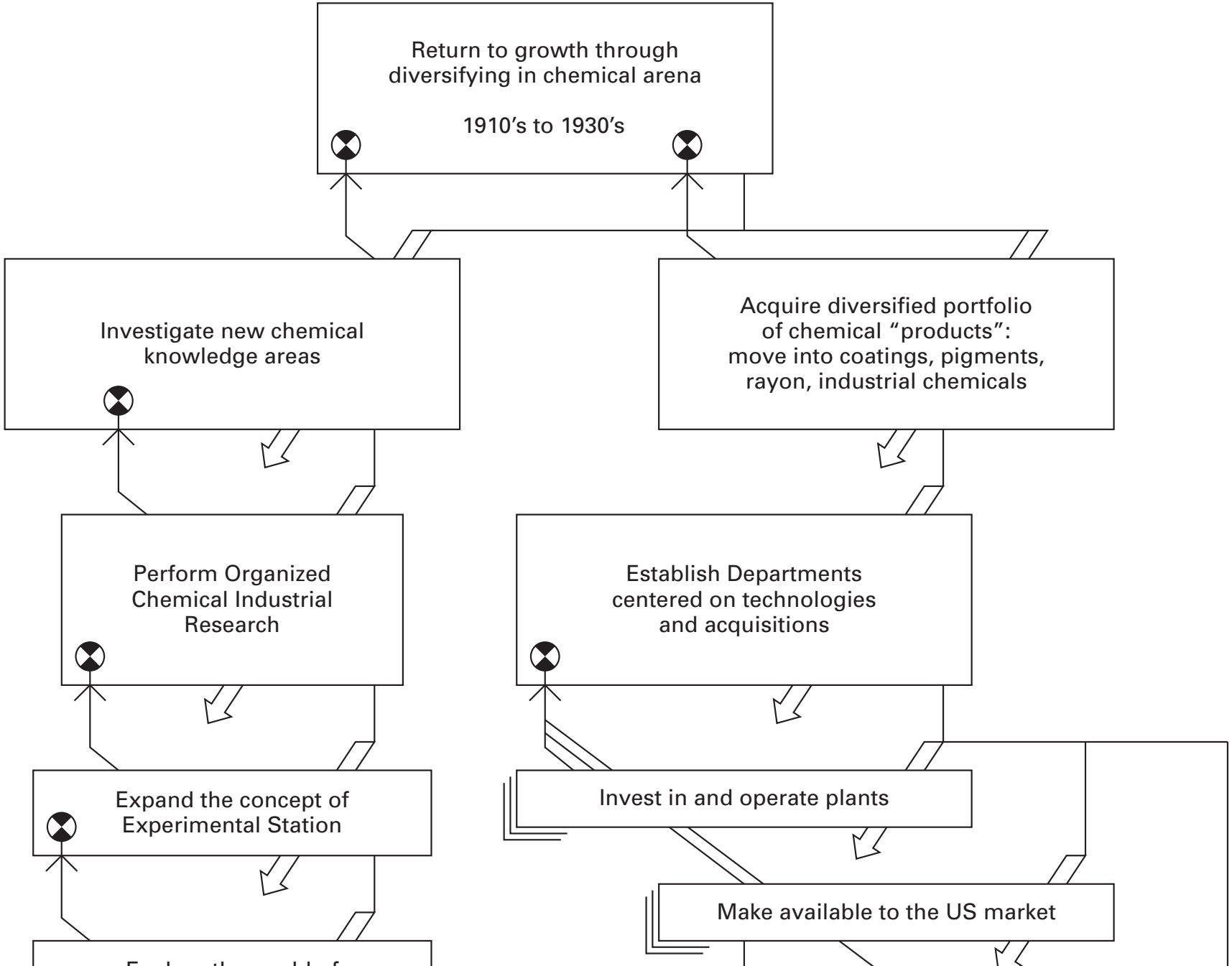


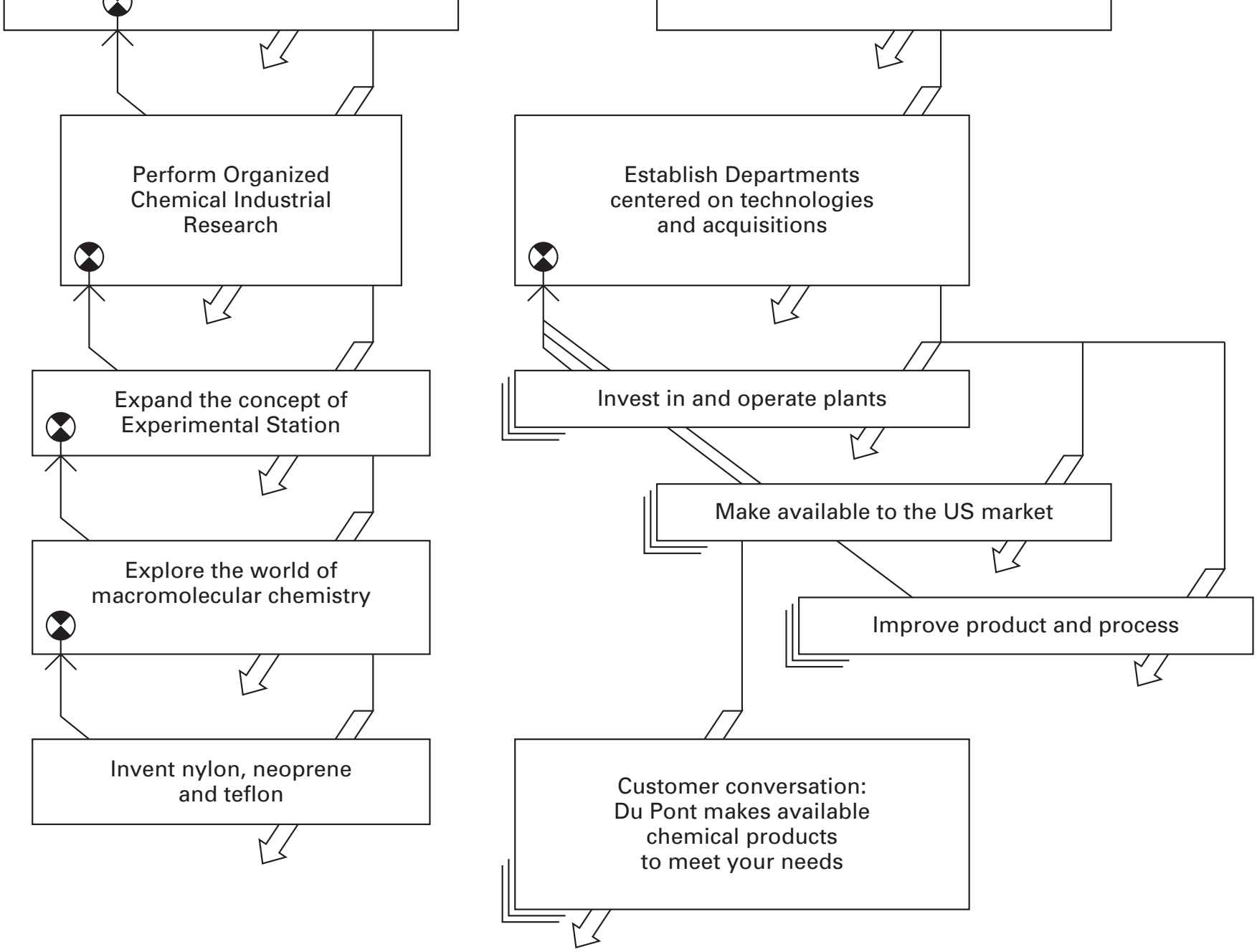

E: comparator
A: Controlling Process
(alias goal)
D: return of
results
of execution
F: iterative
execution
C: injunction
to execute
B: Controlled Process
(alias method)

Du Pont Goal Structure
Snapshot 1910 to 1940

Laid the foundation for a new business—
"invention" phase.

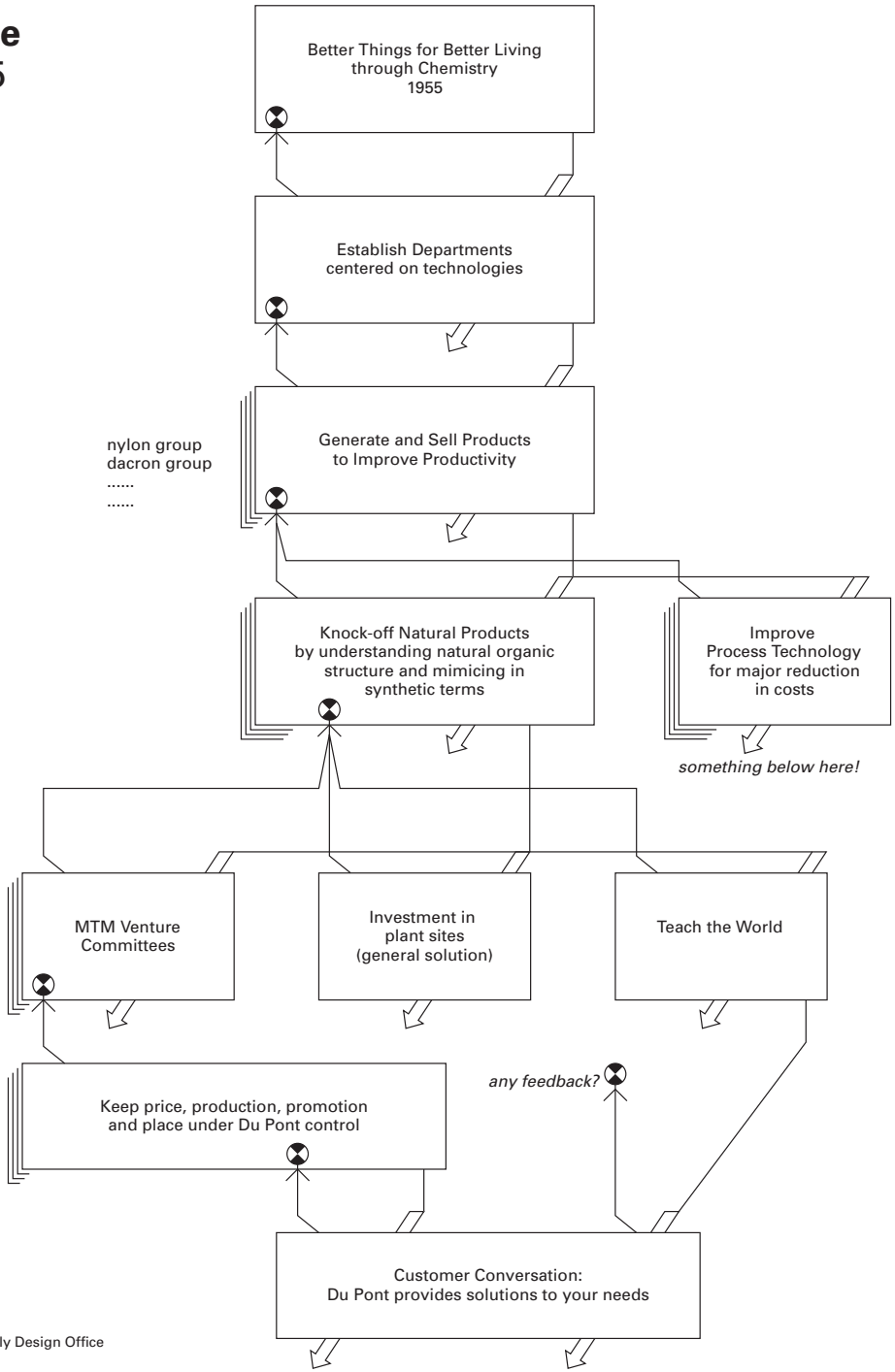



Return to growth through diversifying in chemical arena
1910's to 1930's
Investigate new chemical knowledge areas
Acquire diversified portfolio of chemical "products": move into coatings, pigments, rayon, industrial chemicals
Perform Organized Chemical Industrial Research
Establish Departments centered on technologies and acquisitions
Expand the concept of Experimental Station
Invest in and operate plants
Make available to the US market

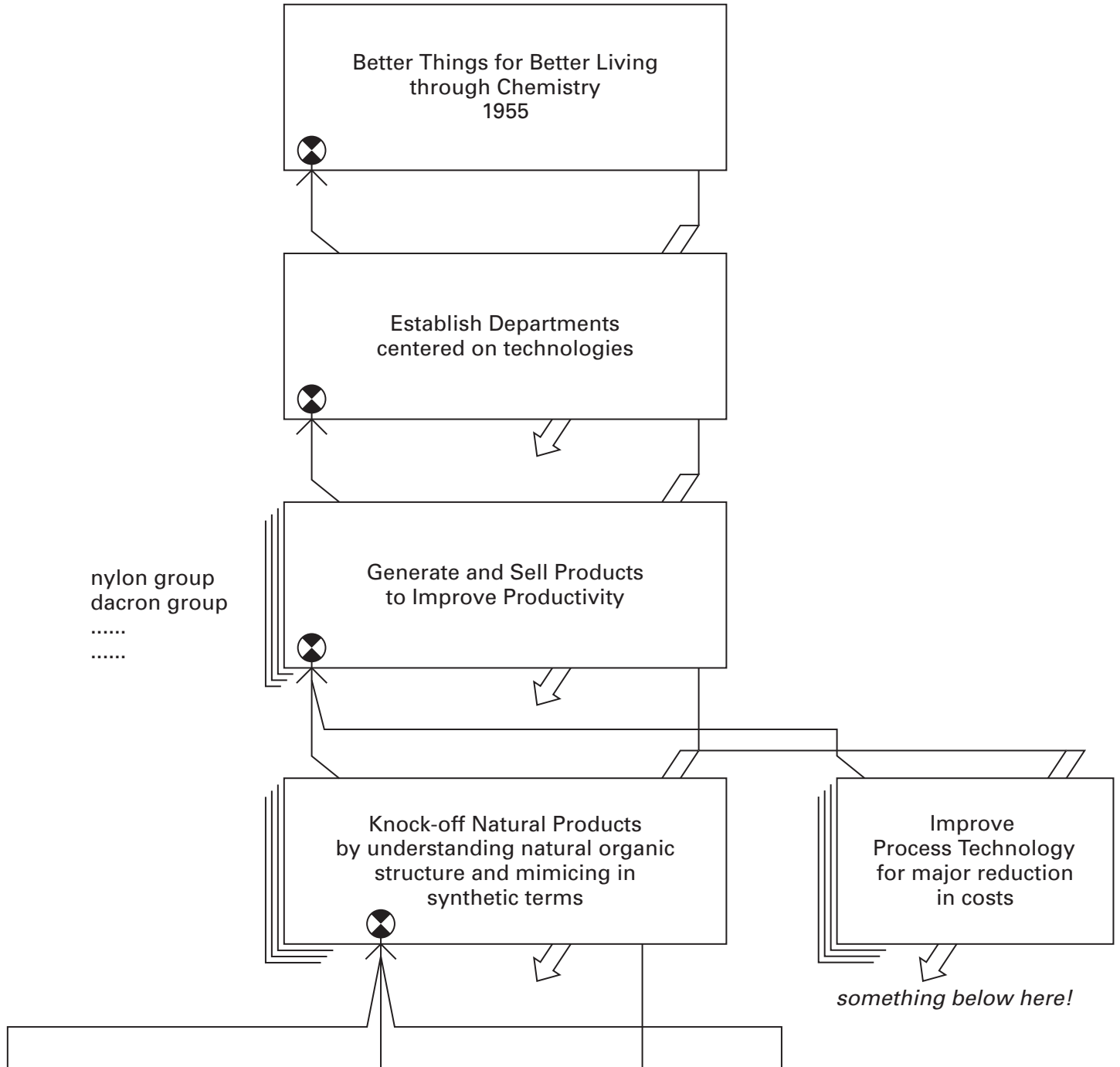

Perform Organized Chemical Industrial Research
Expand the concept of Experimental Station
Explore the world of macromolecular chemistry
Invent nylon, neoprene and teflon
Establish Departments centered on technologies and acquisitions
Invest in and operate plants
Make available to the US market
Improve product and process
Customer conversation: Du Pont makes available chemical products to meet your needs

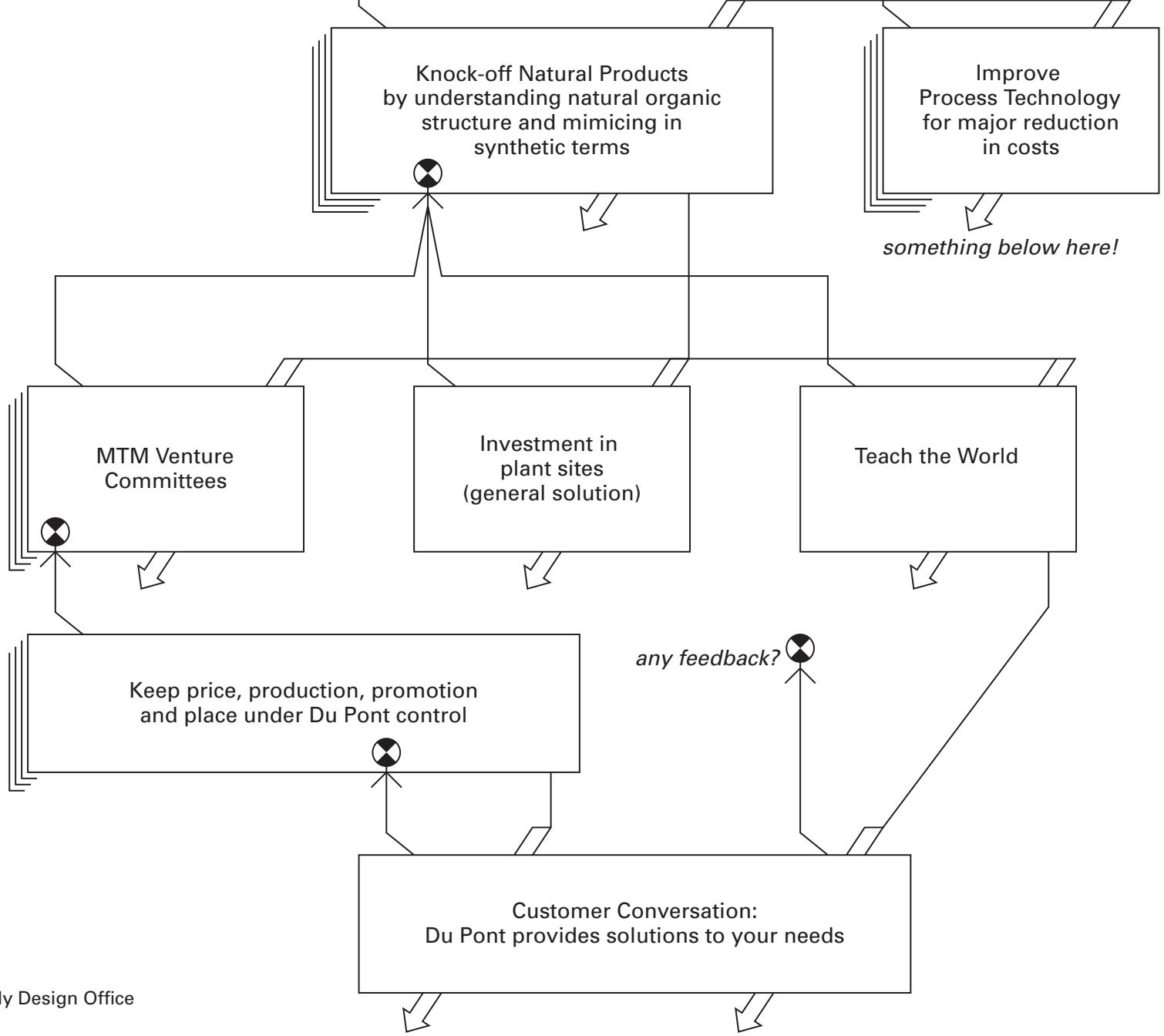
Du Pont Goal Structure
Snapshot 1940 to 1975

Built on the foundation—
"discovery" phase.



Structure
to 1975

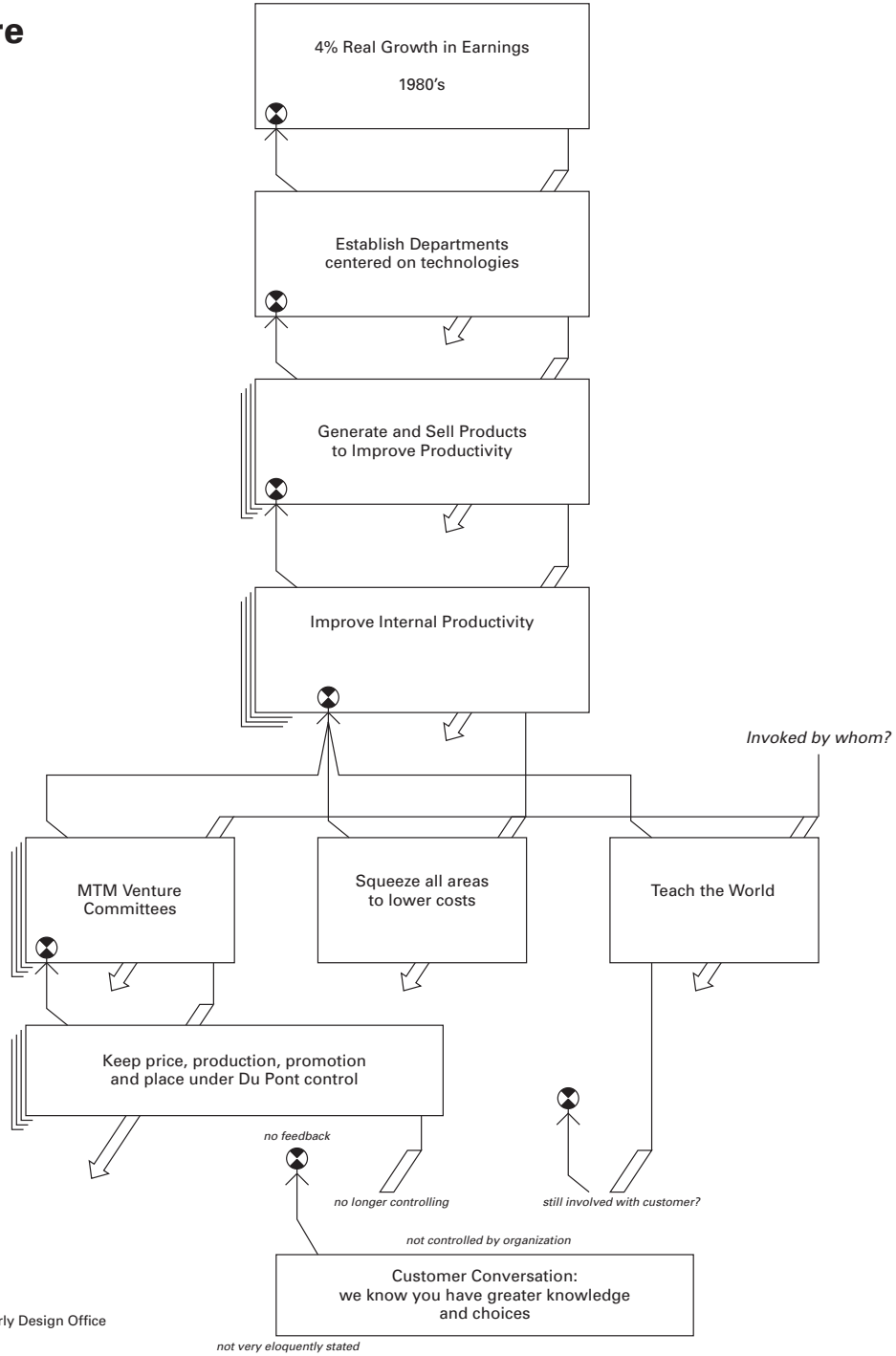




angaro and Dubberly Design Office

Du Pont Goal Structure
Snapshot of 1980's

Milked the existing structure—
"efficiency" phase.



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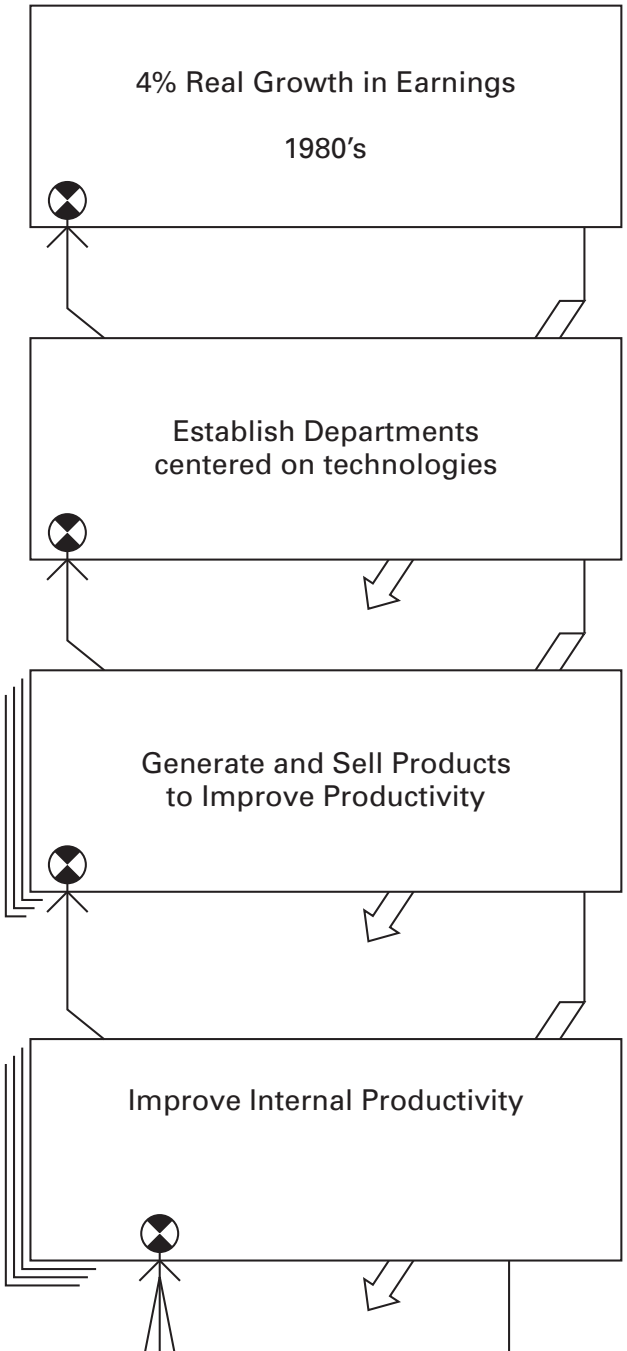
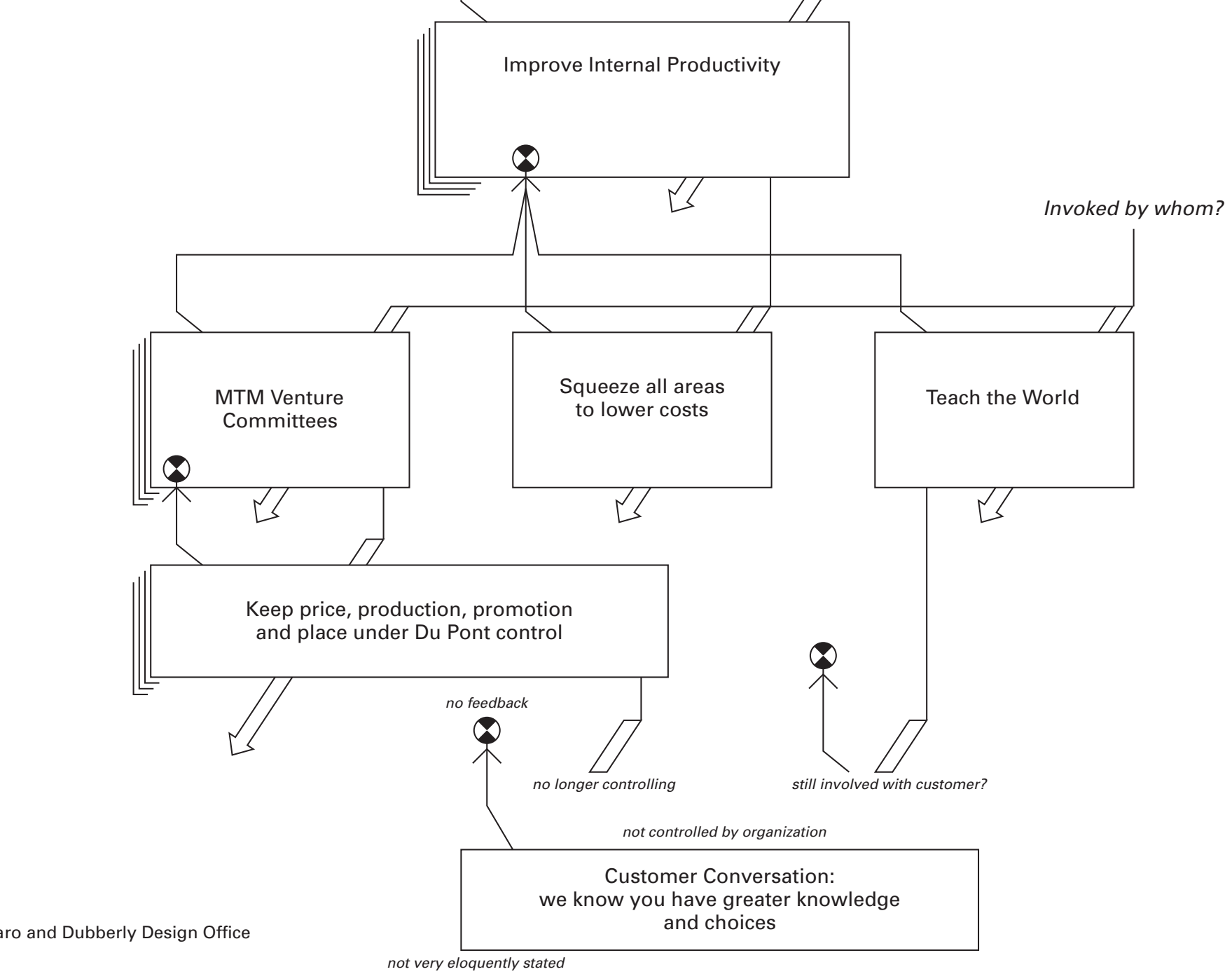
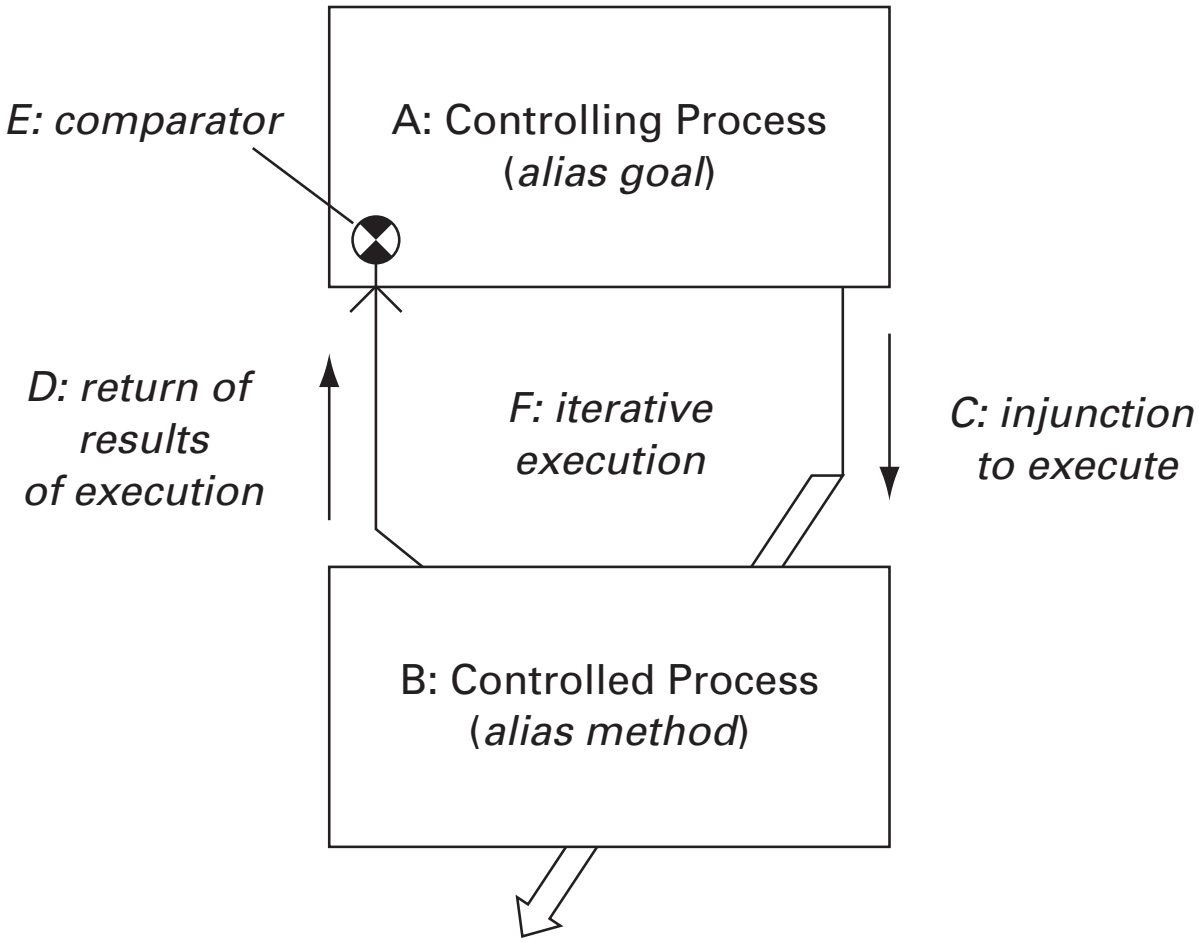


Invoked by whom?



aro and Dubberly Design Office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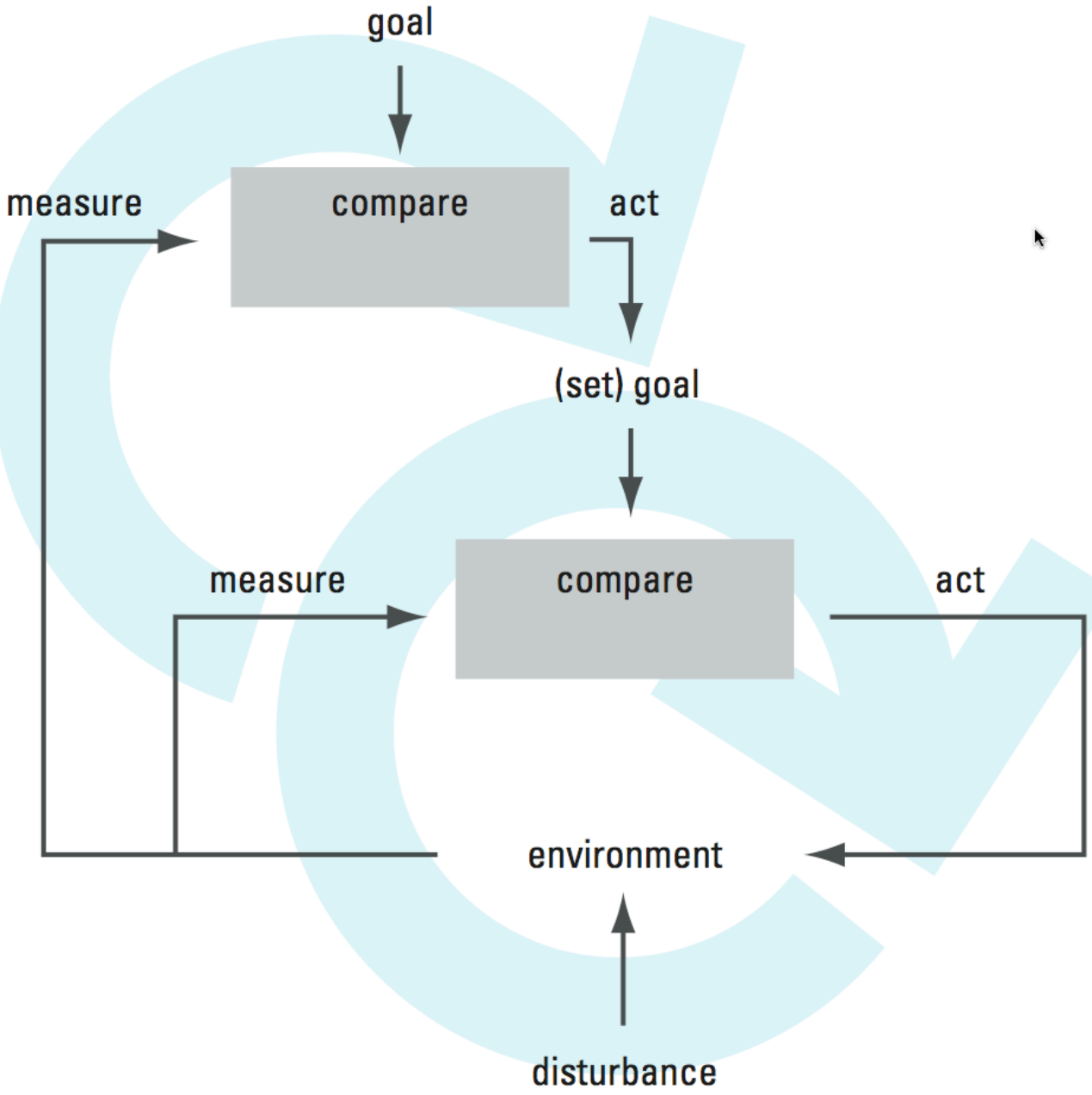
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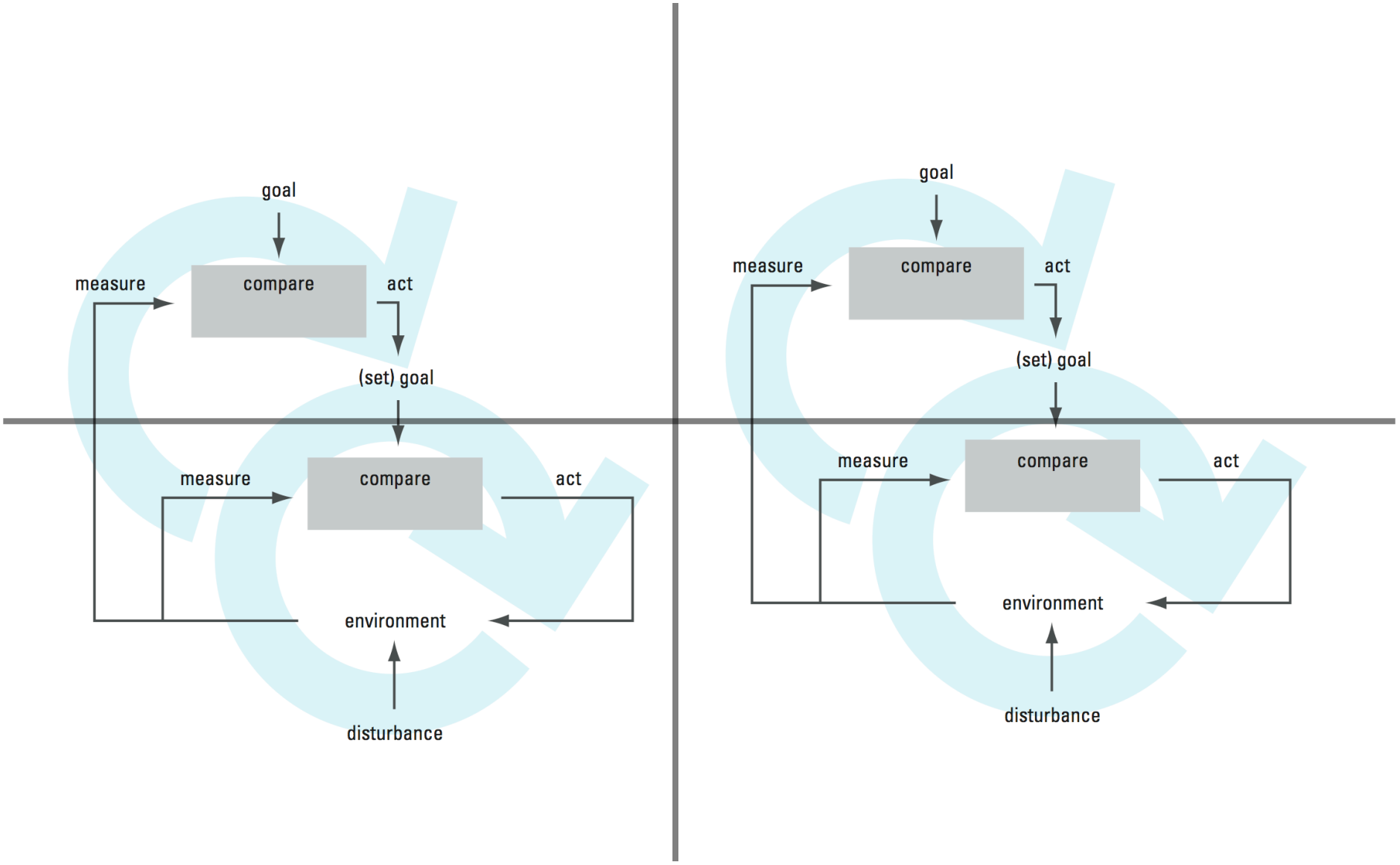
disturbance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compare
act
(set) goal
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compare
act
environment
disturbance
goal
measure
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act
(set) goal
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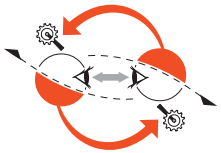
compare
act
environment
disturbance

CONVERSATION

cybernetics reviewed

Gordon Pask

double-loop architectures

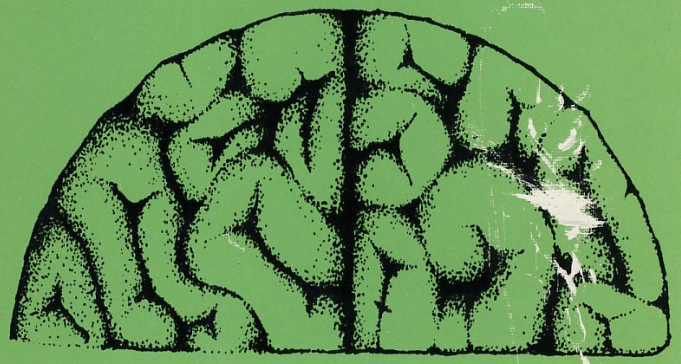


conversation theory

application

GORDON PASK

CONVERSATION, COGNITION AND LEARNING



A CYBERNETIC THEORY AND METHODOLOGY

ELSEVIER

GORDON PASK

CONVERSATION THEORY

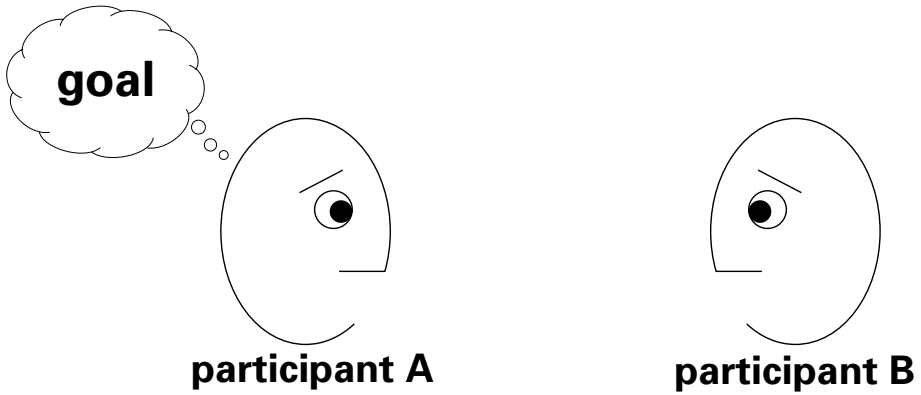
APPLICATIONS IN EDUCATION AND EPISTEMOLOGY

ELSEVIER

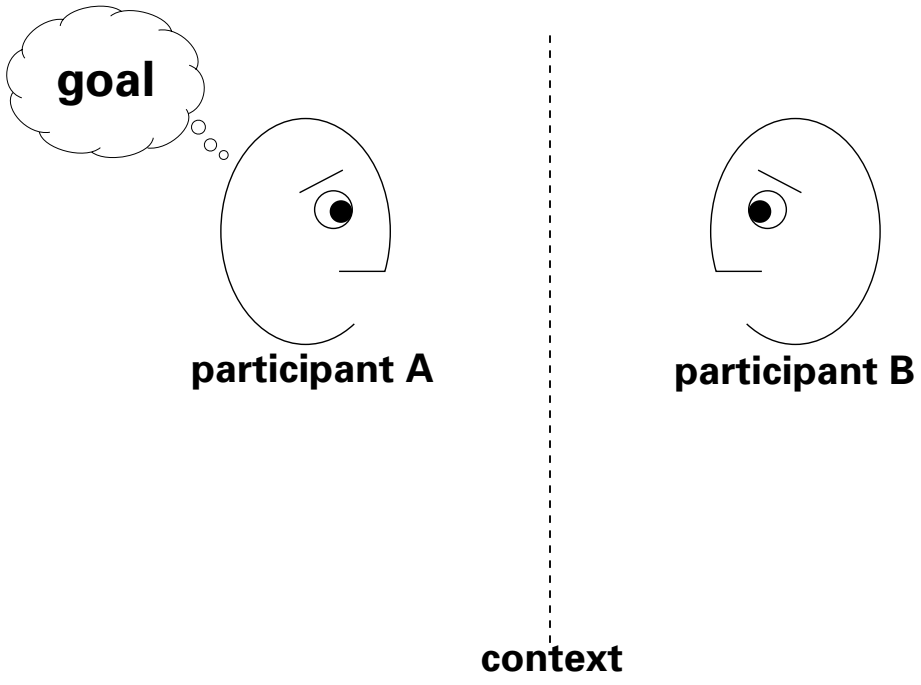
how does conversation work?

after Dubberly Design Office 2008

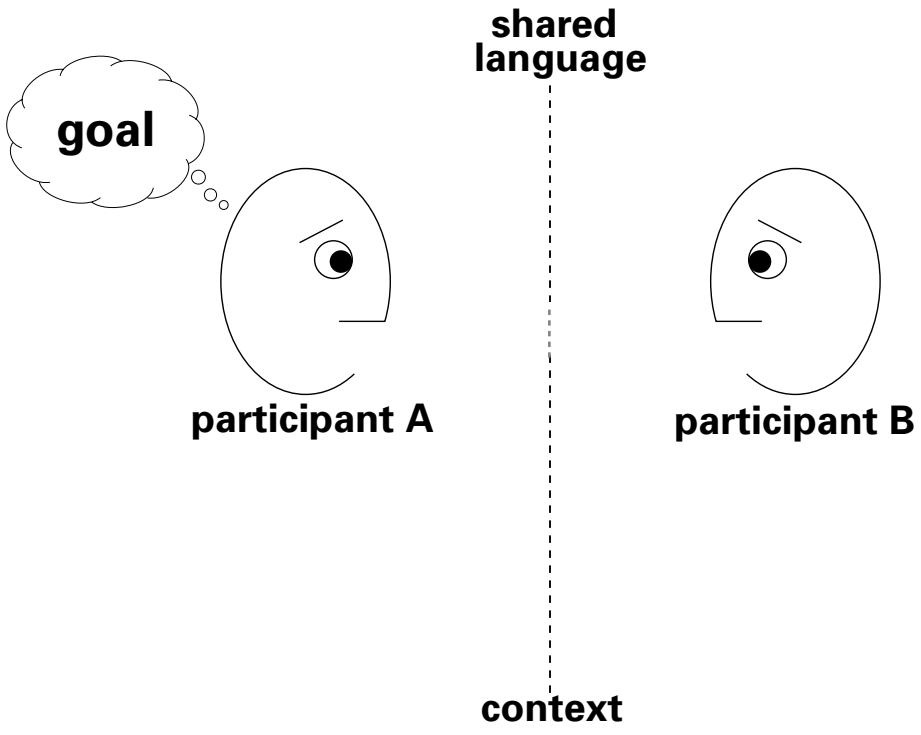
a participant has a goal



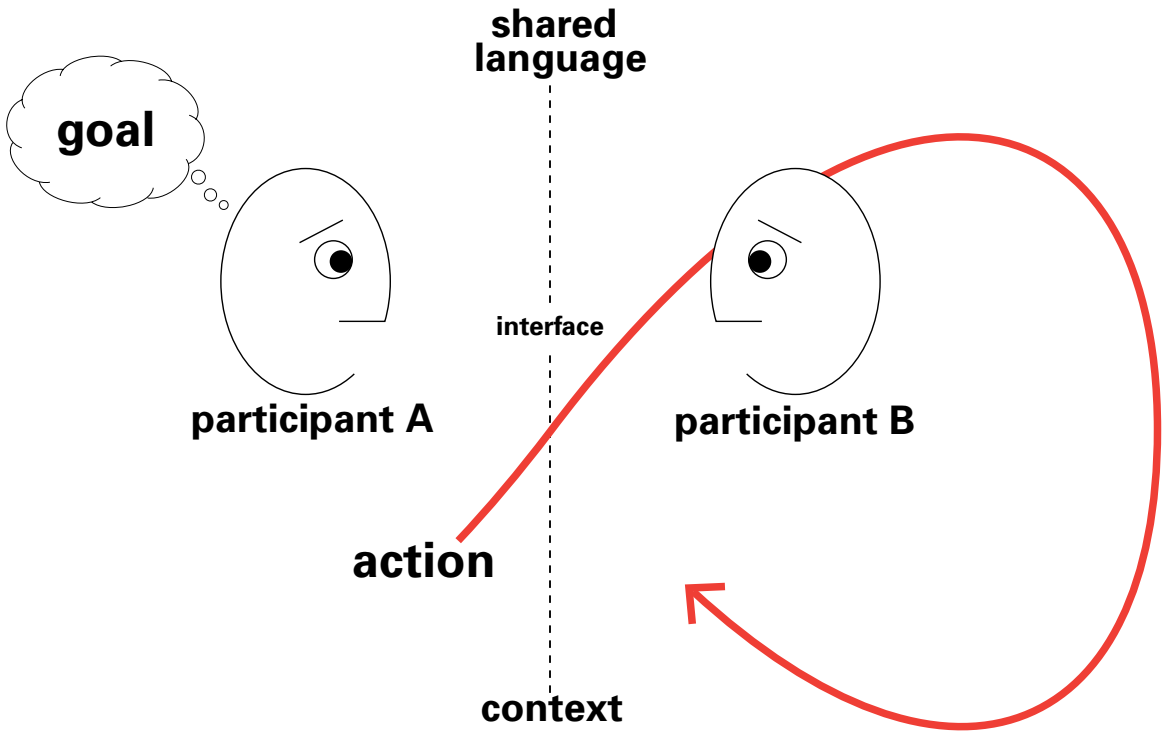
chooses a context



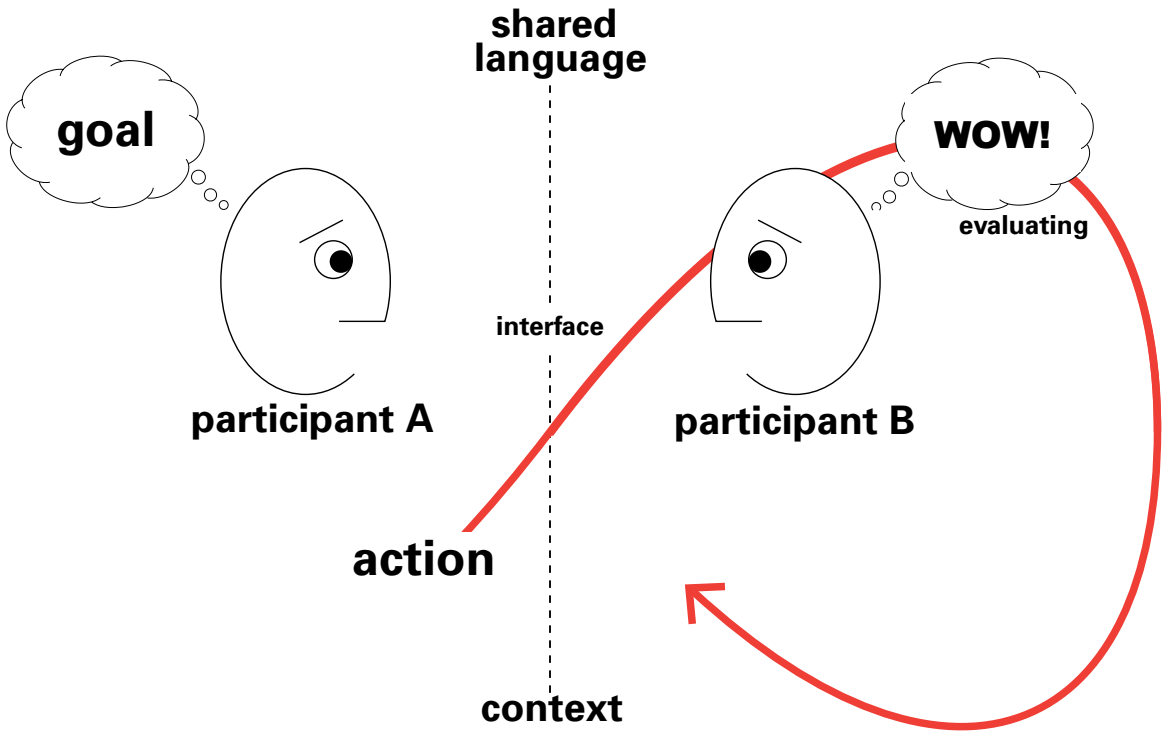
chooses a language



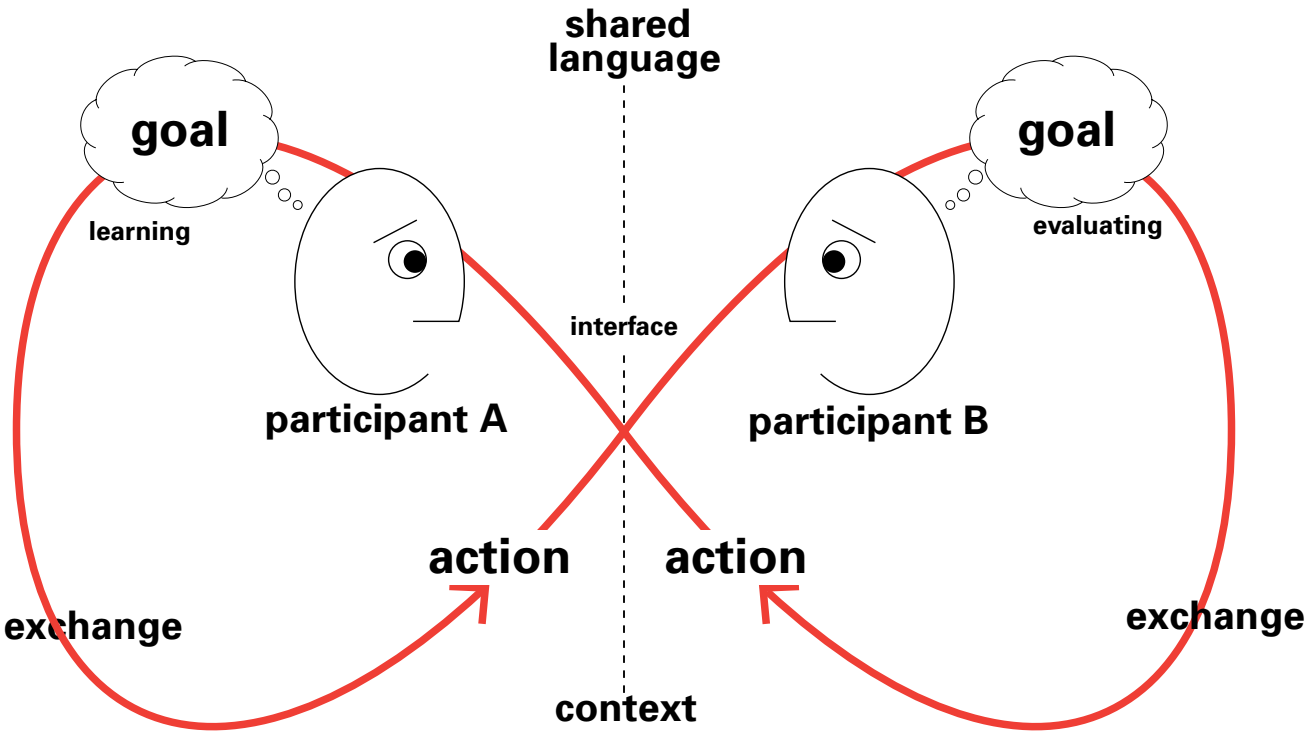
begins an exchange



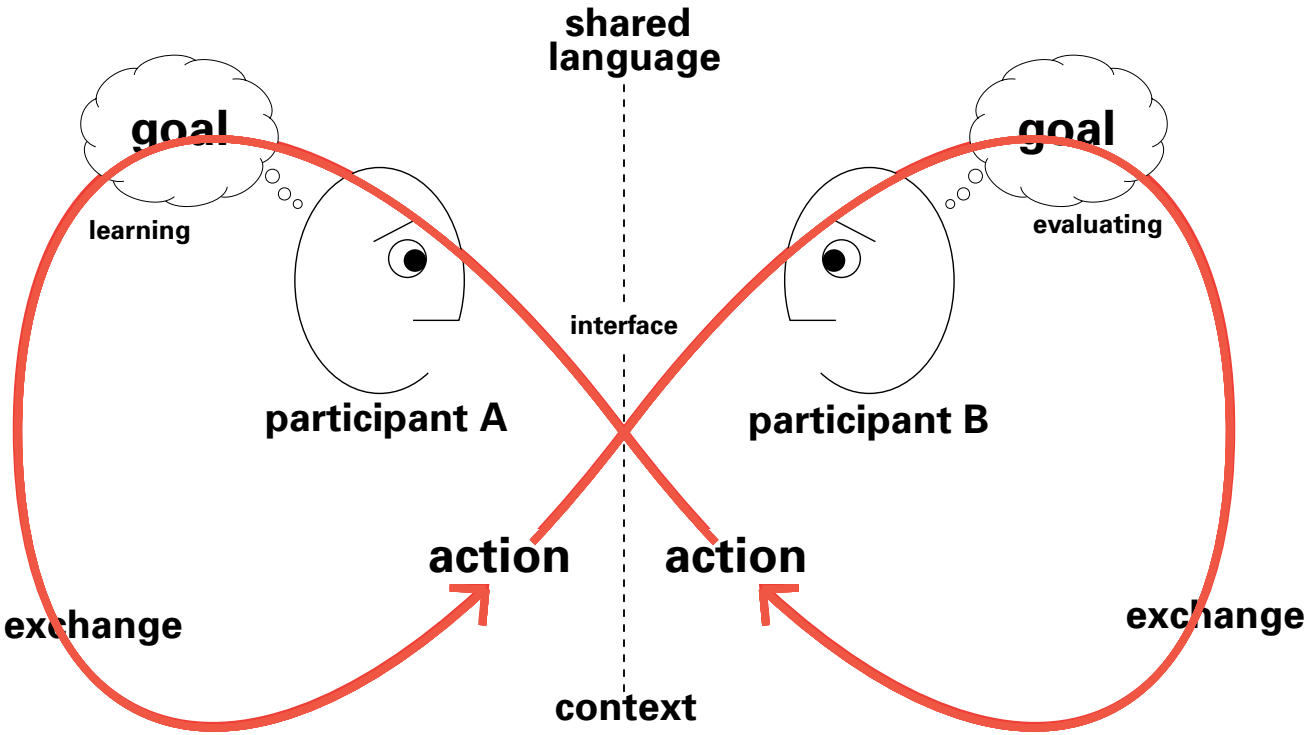
evokes a reaction...



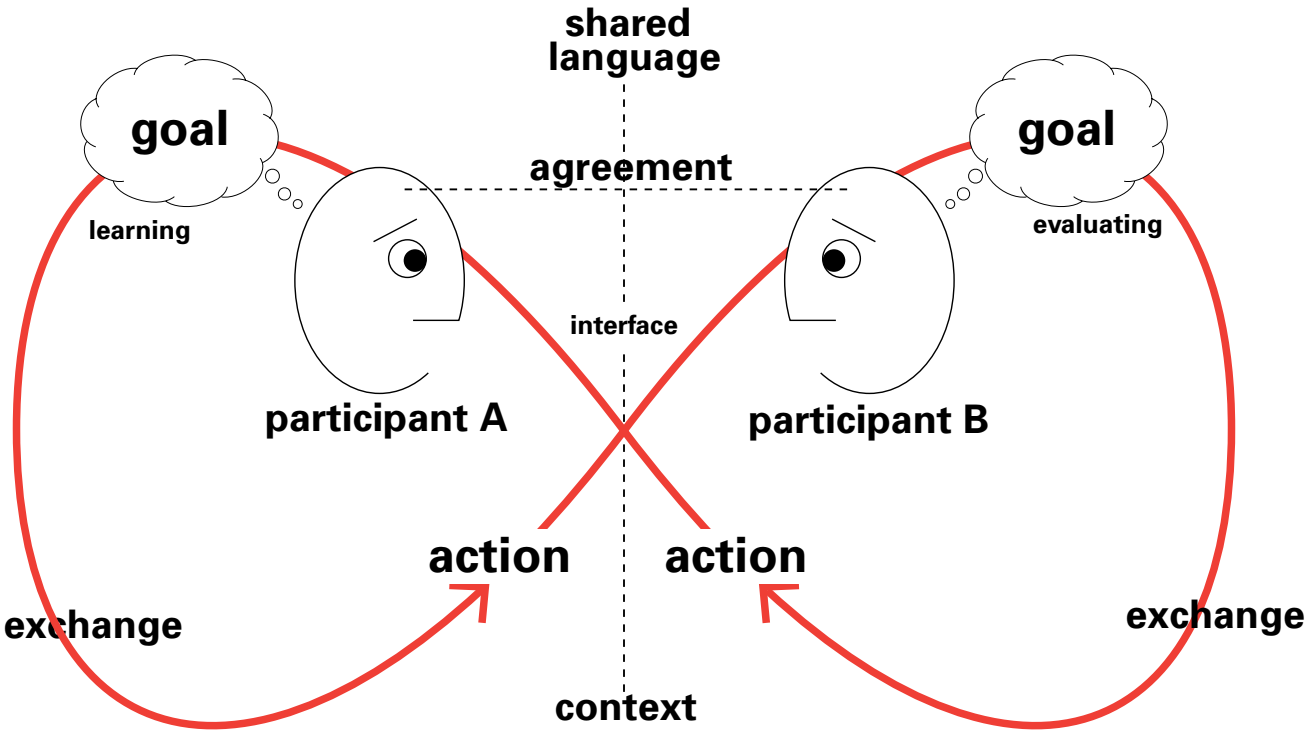
...that evokes a reaction



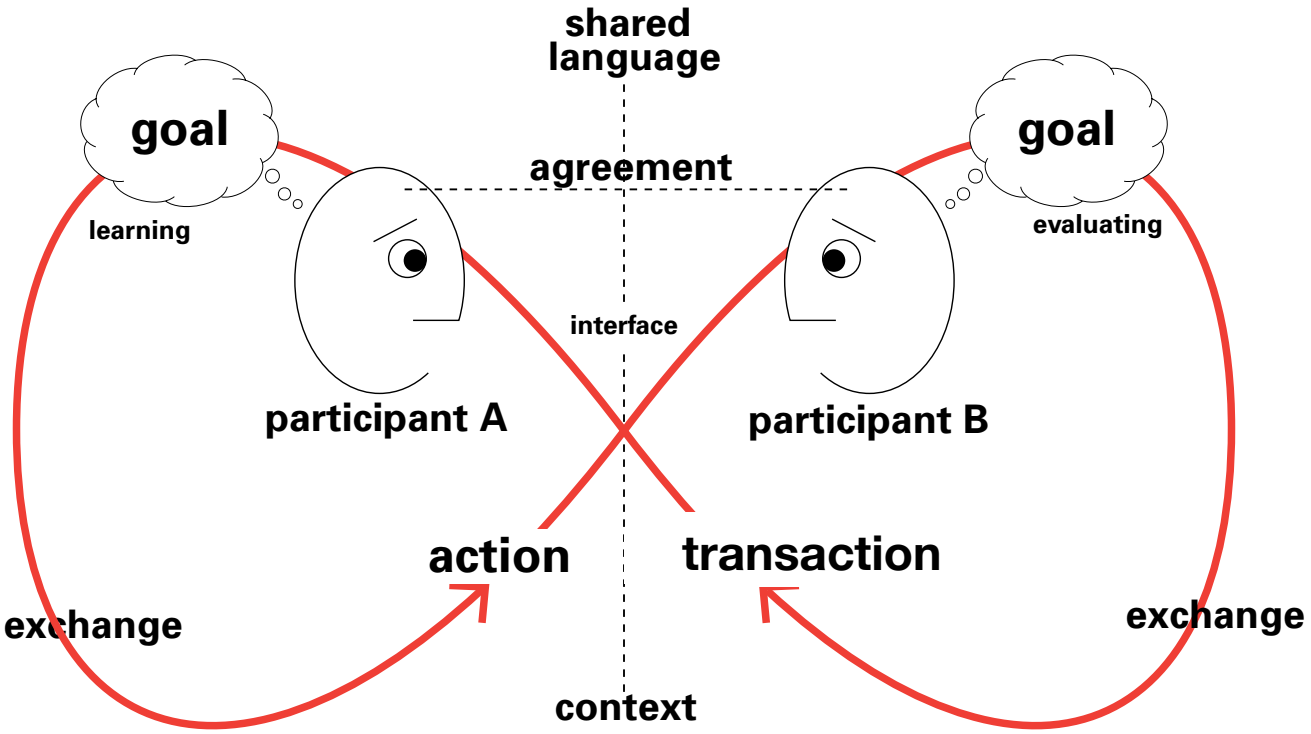
the exchange may continue



agreement may be reached

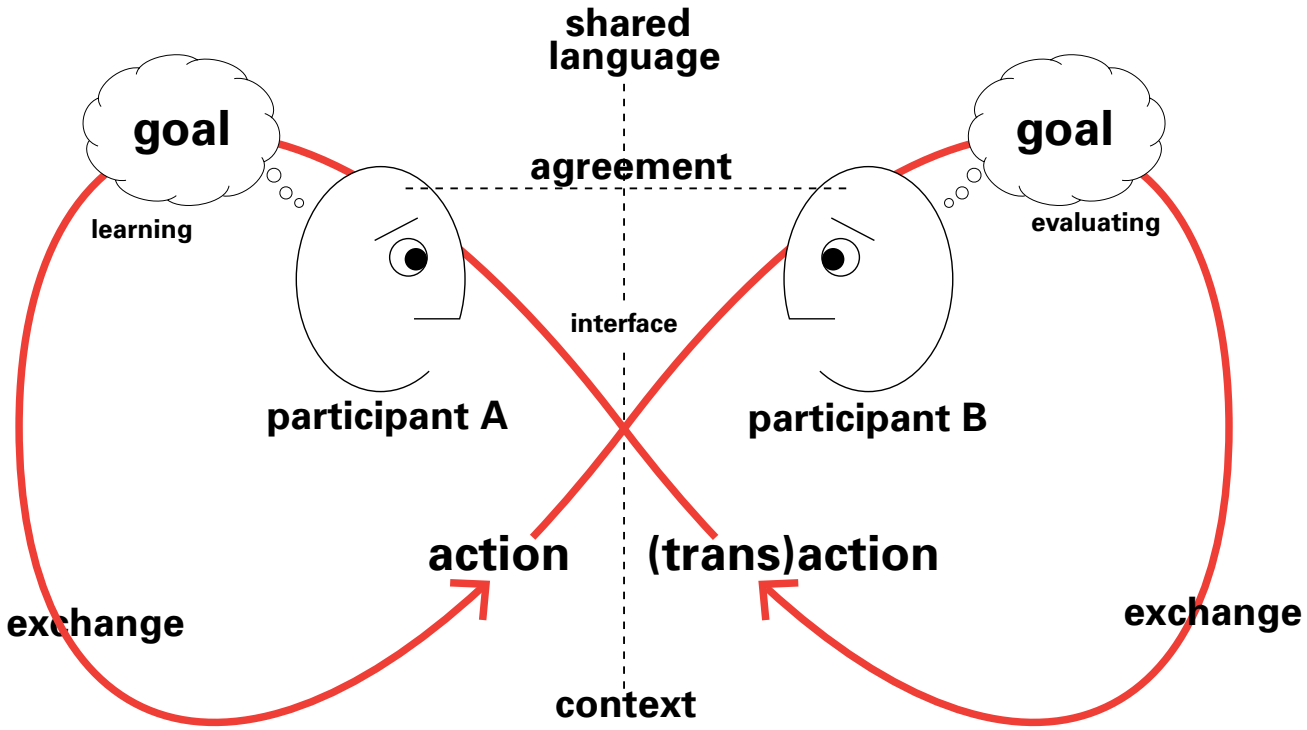


a transaction may occur

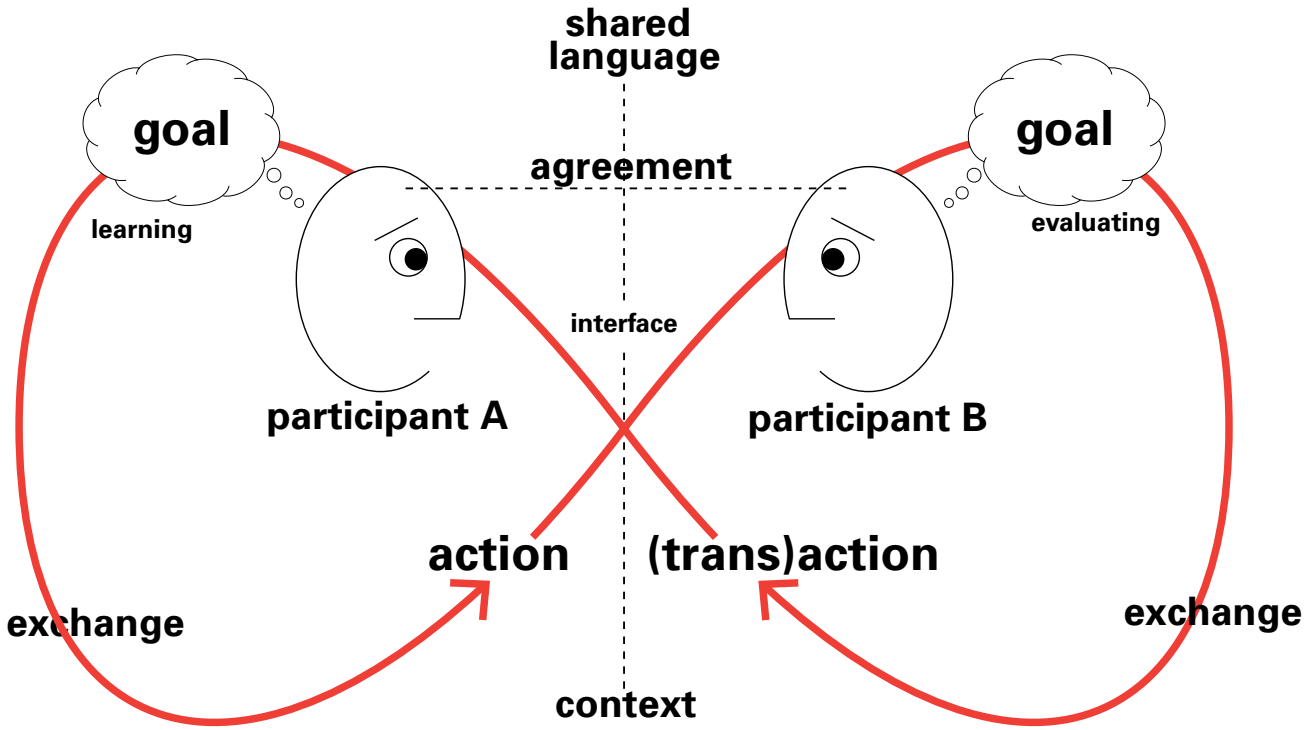


after Dubberly Design Office 2008

CONVERSATION REDUX

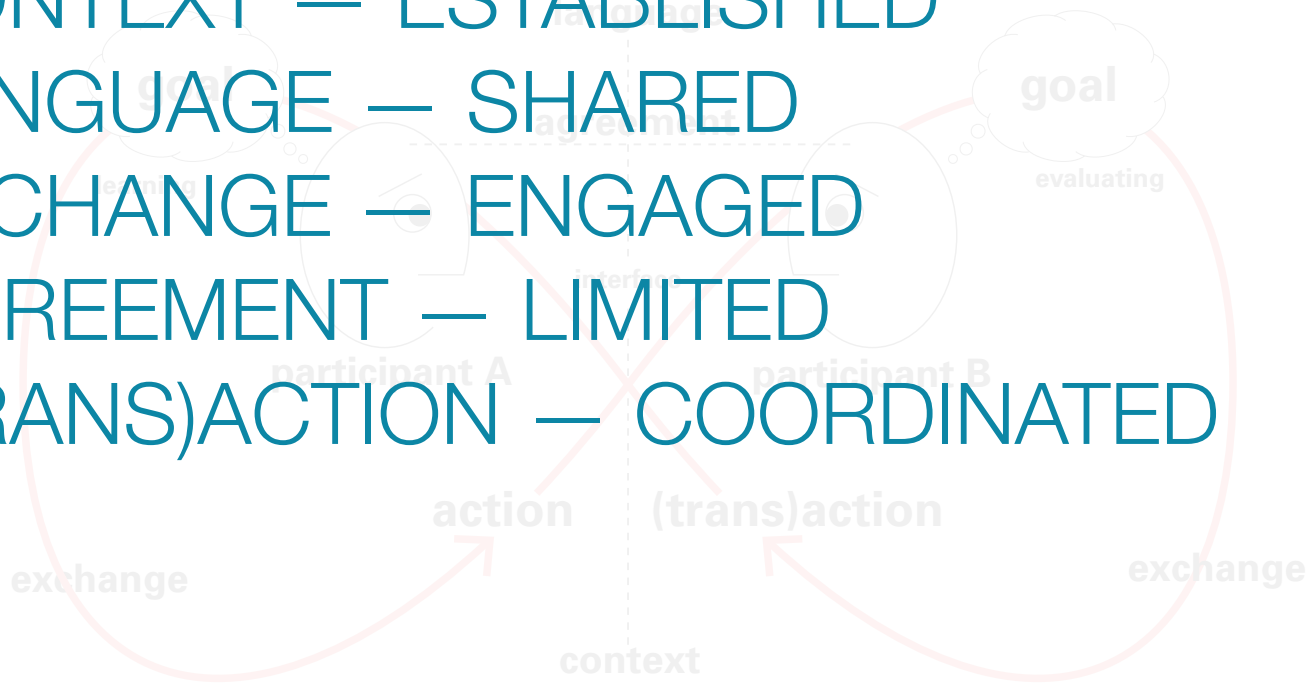


CONVERSATION = C-L-E-A-T



CONVERSATION = C-L-E-A-T

CONTEXT — ESTABLISHED
LANGUAGE — SHARED
EXCHANGE — ENGAGED
AGREEMENT — LIMITED
(TRANS)ACTION — COORDINATED



communication vs. conversation

	communication	conversation
theory	information theory	conversation theory
focus	reliability of channel	reliability of understanding
frame	episodic / fixed repertoire	continuous / unbounded
type of uncertainty	probabilistic	modal
atom	message	difference
molecule	message repertoire	coherence
objective + metric	correctness of message	degree of agreement
strength	disambiguating	evolving knowledge
limitation	not about new messages	takes effort to quantify

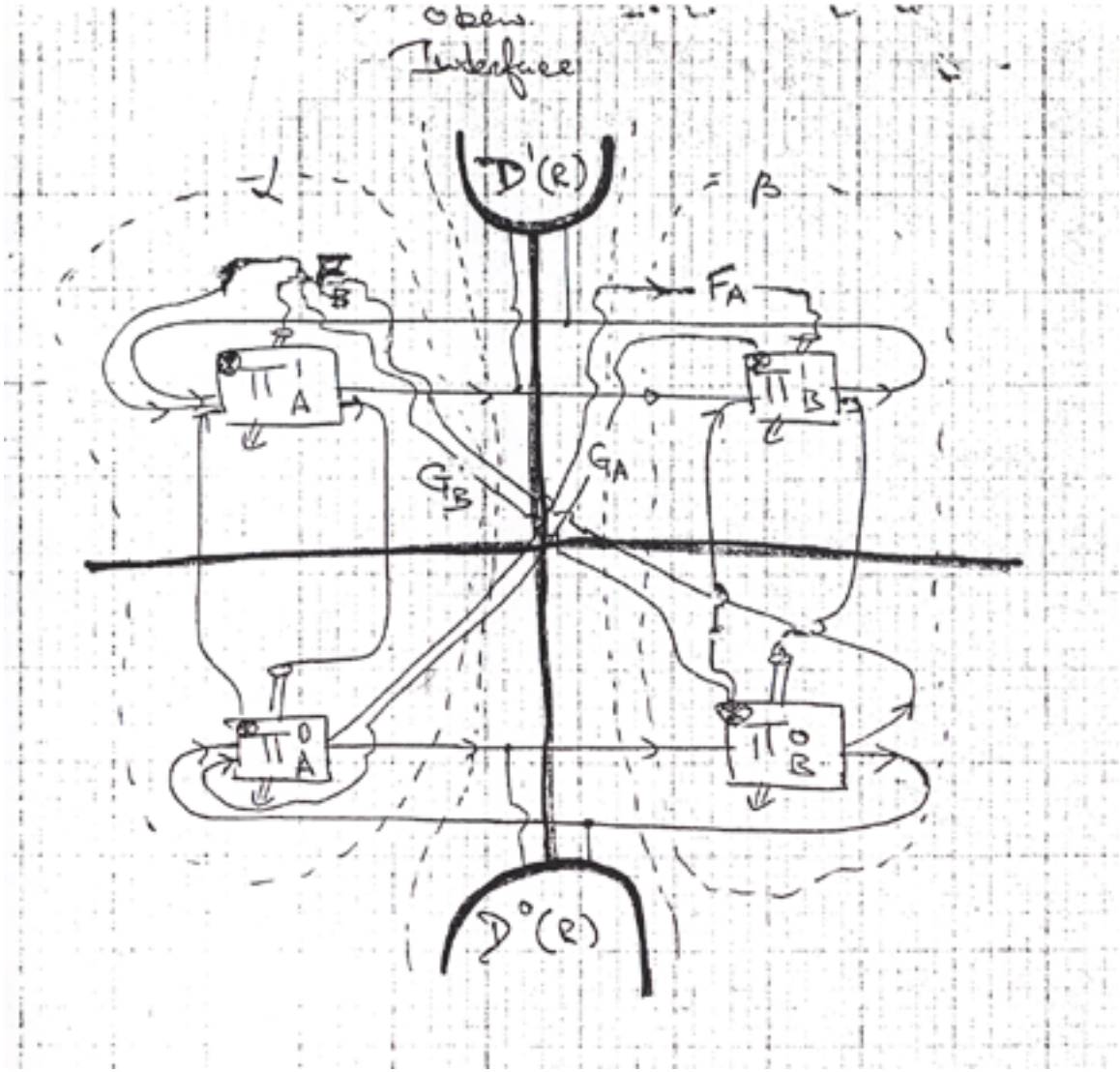
Soft
Archi
tec
ture
Ma
chines
Nicholas
Negroponte
Soft Architecture Machines
Negroponte

1

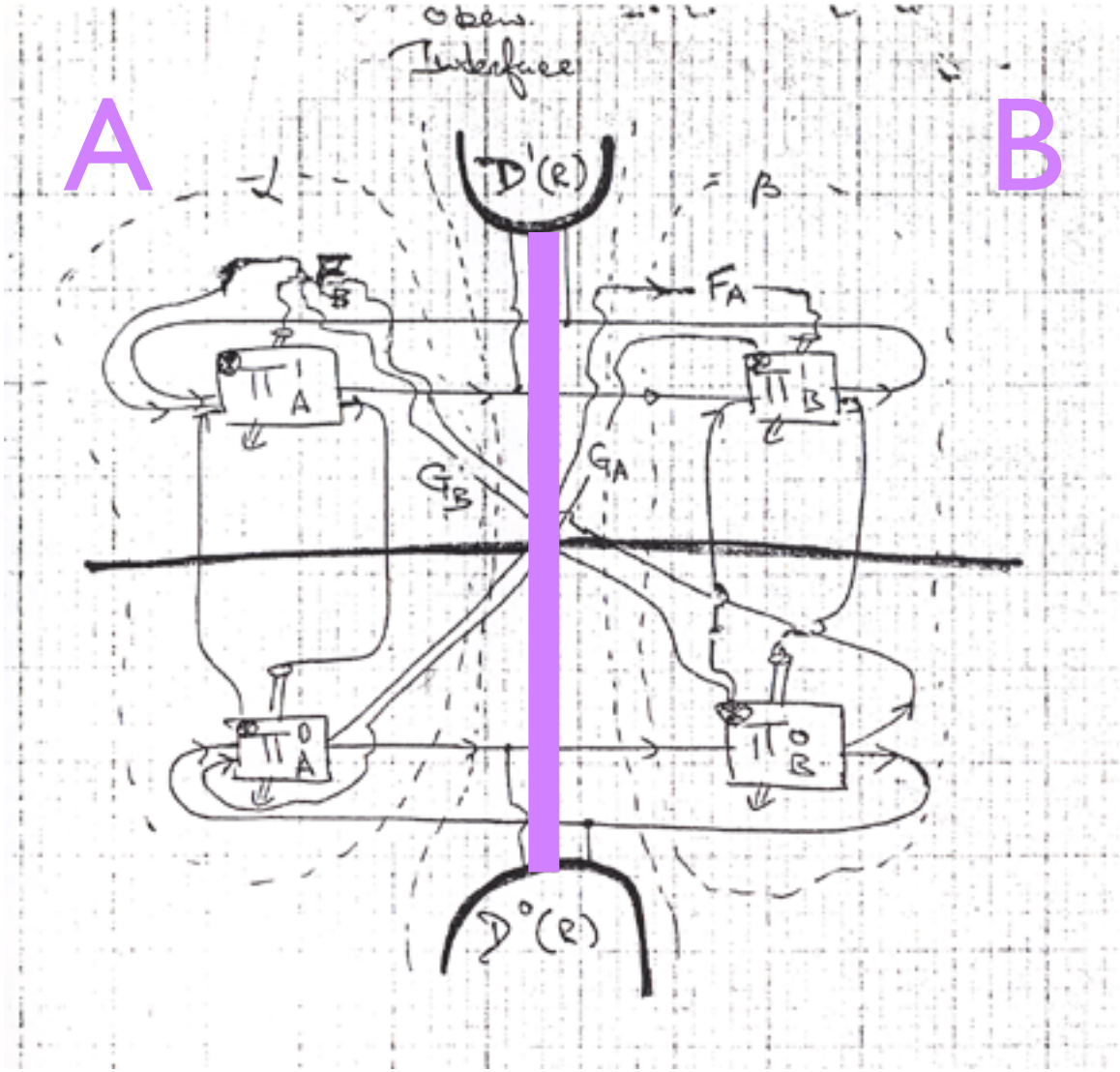
Aspects of Machine Intelligence

Introduction by Gordon Pask

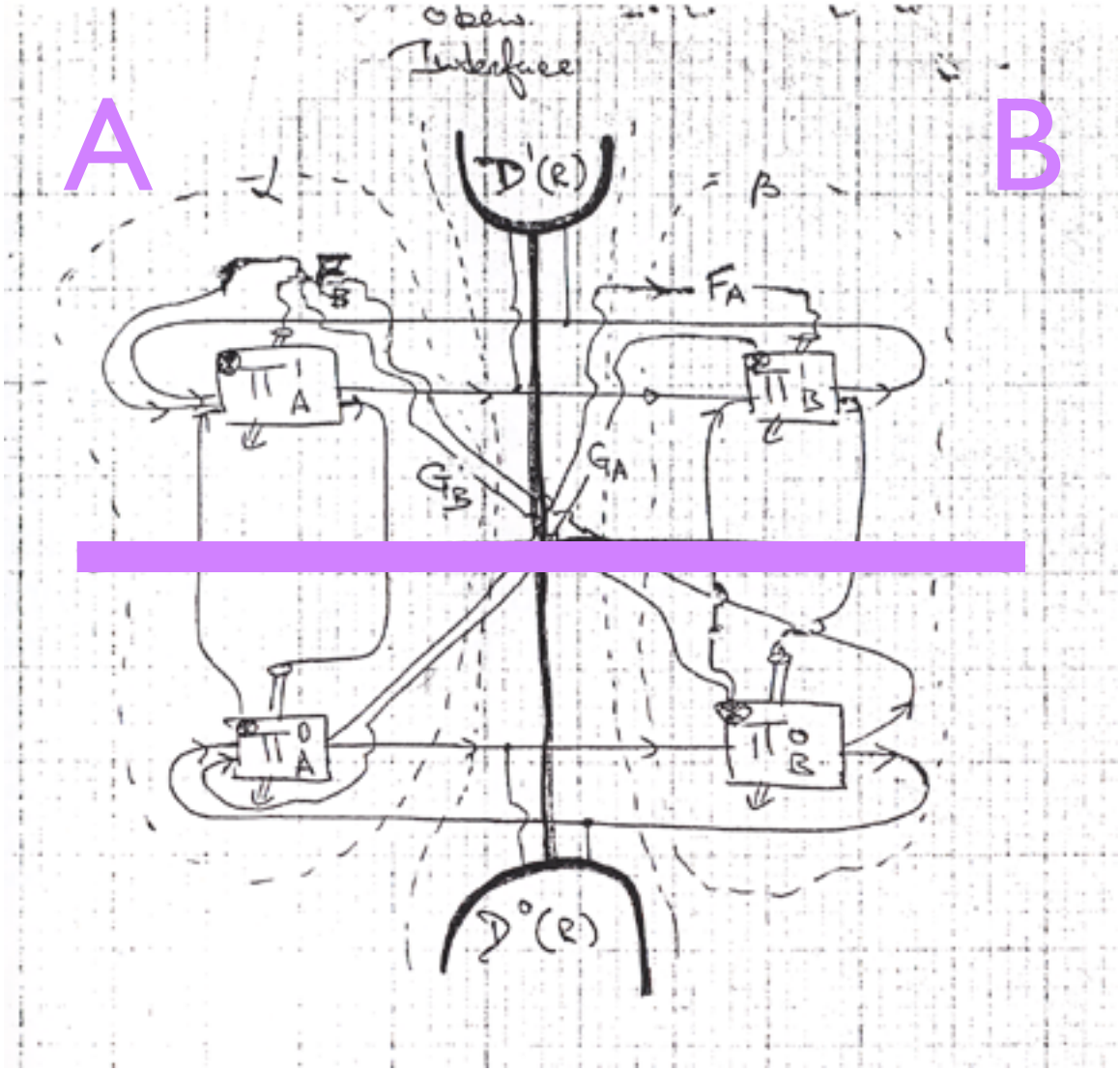
Pask's hand rendering from *Soft Architecture Machines*



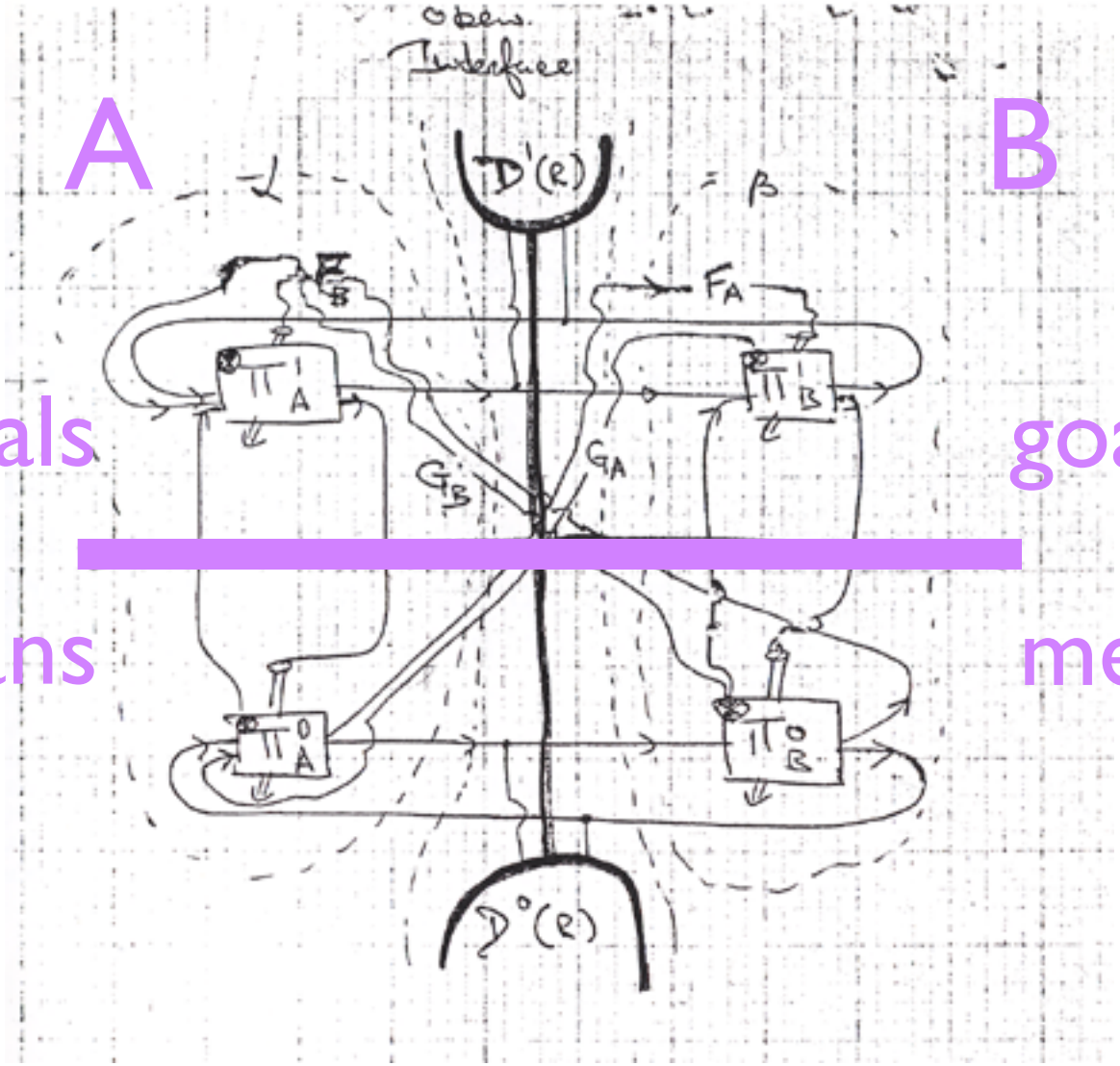
architecture—solitary action—individuals



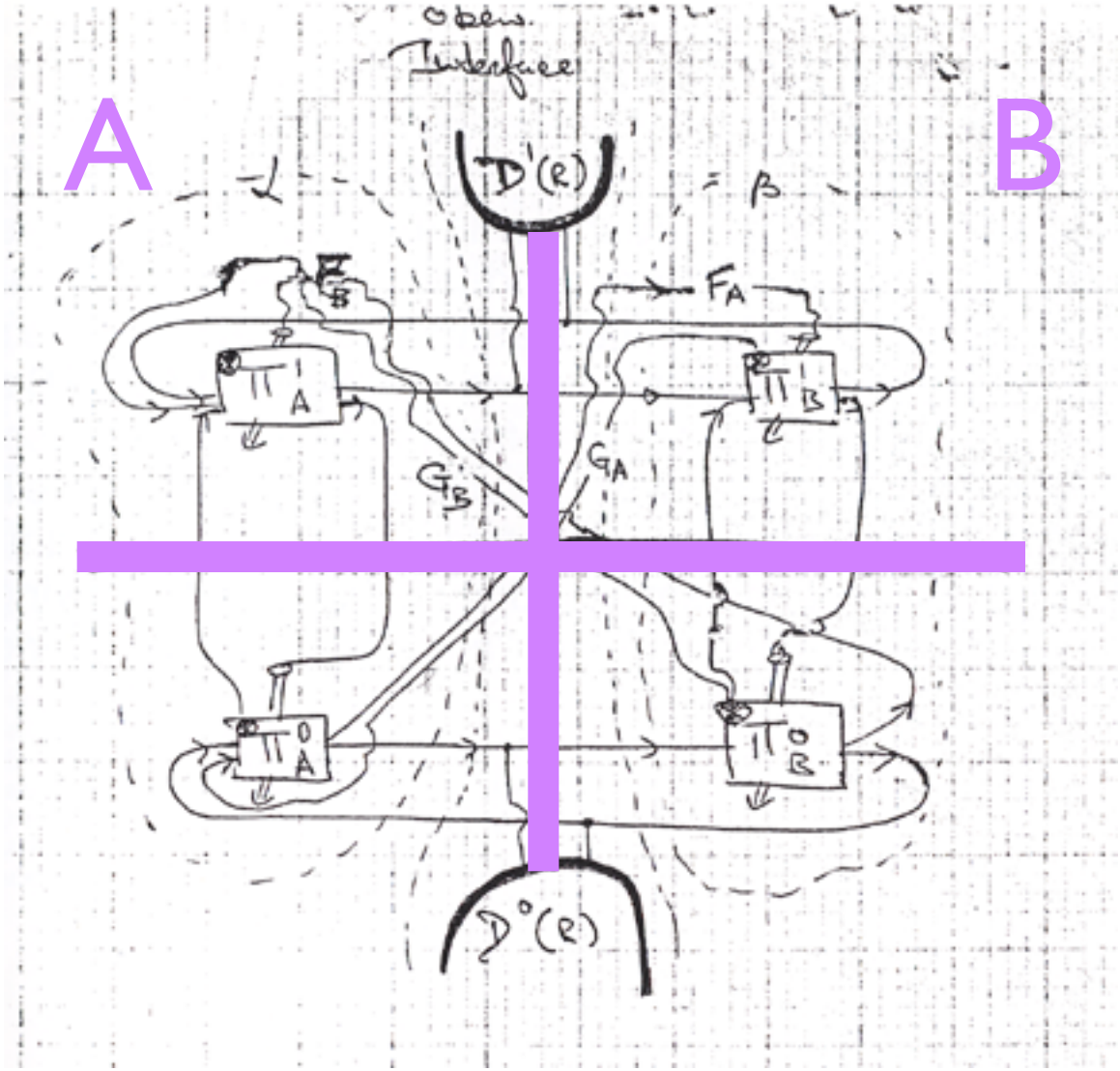
architecture—conversation—participants



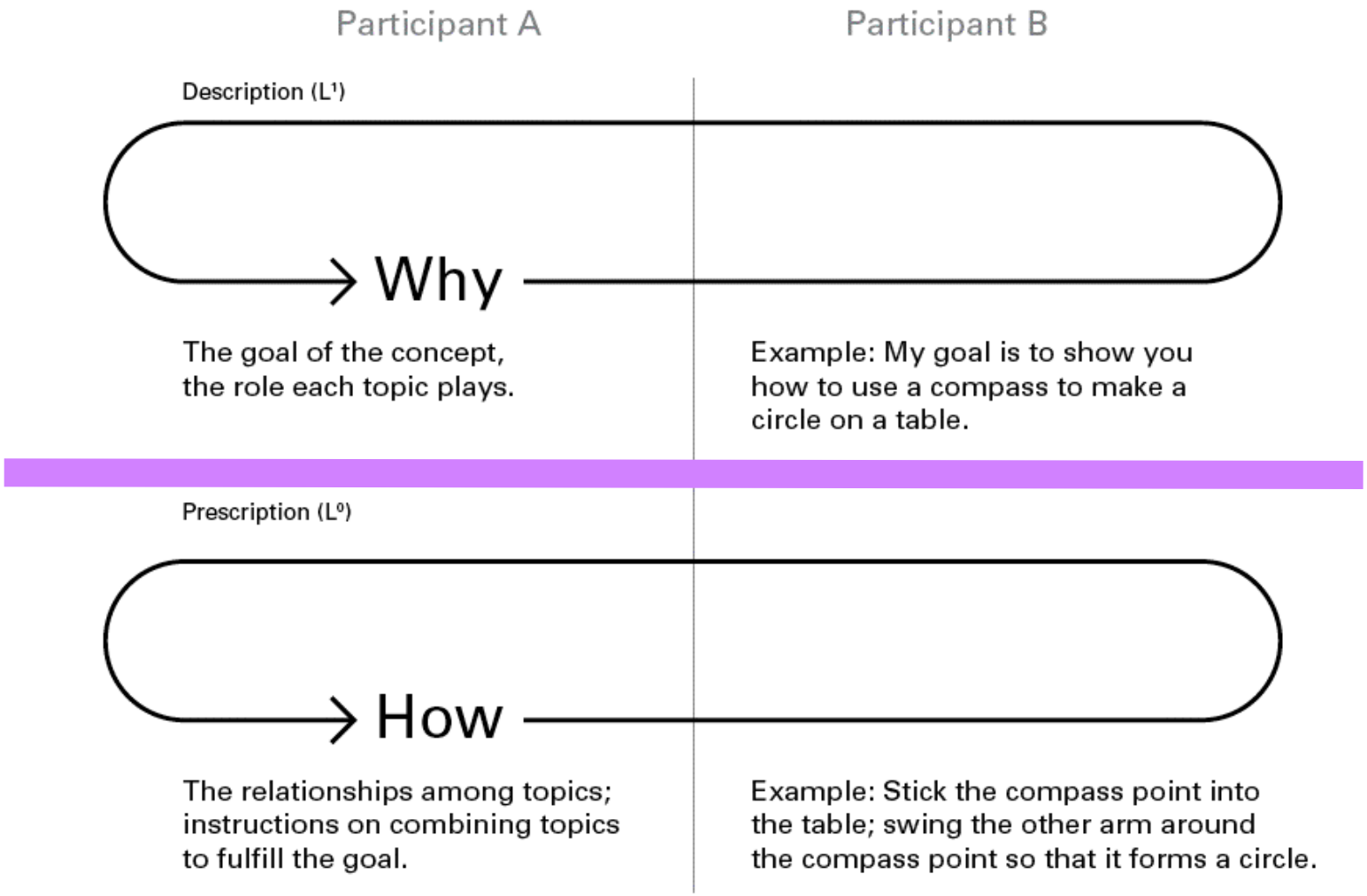
architecture—conversation—participants



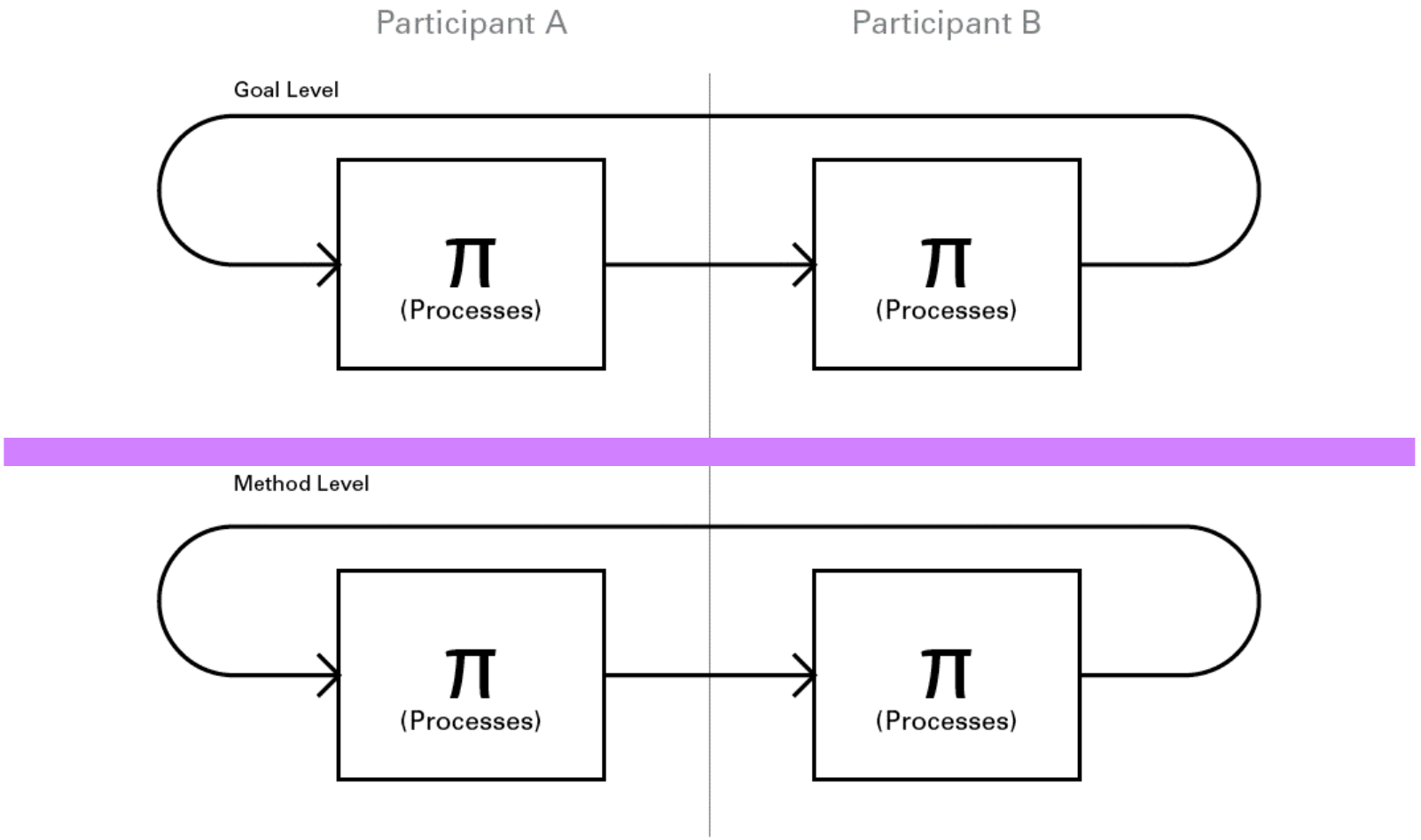
architecture—levels—conversation



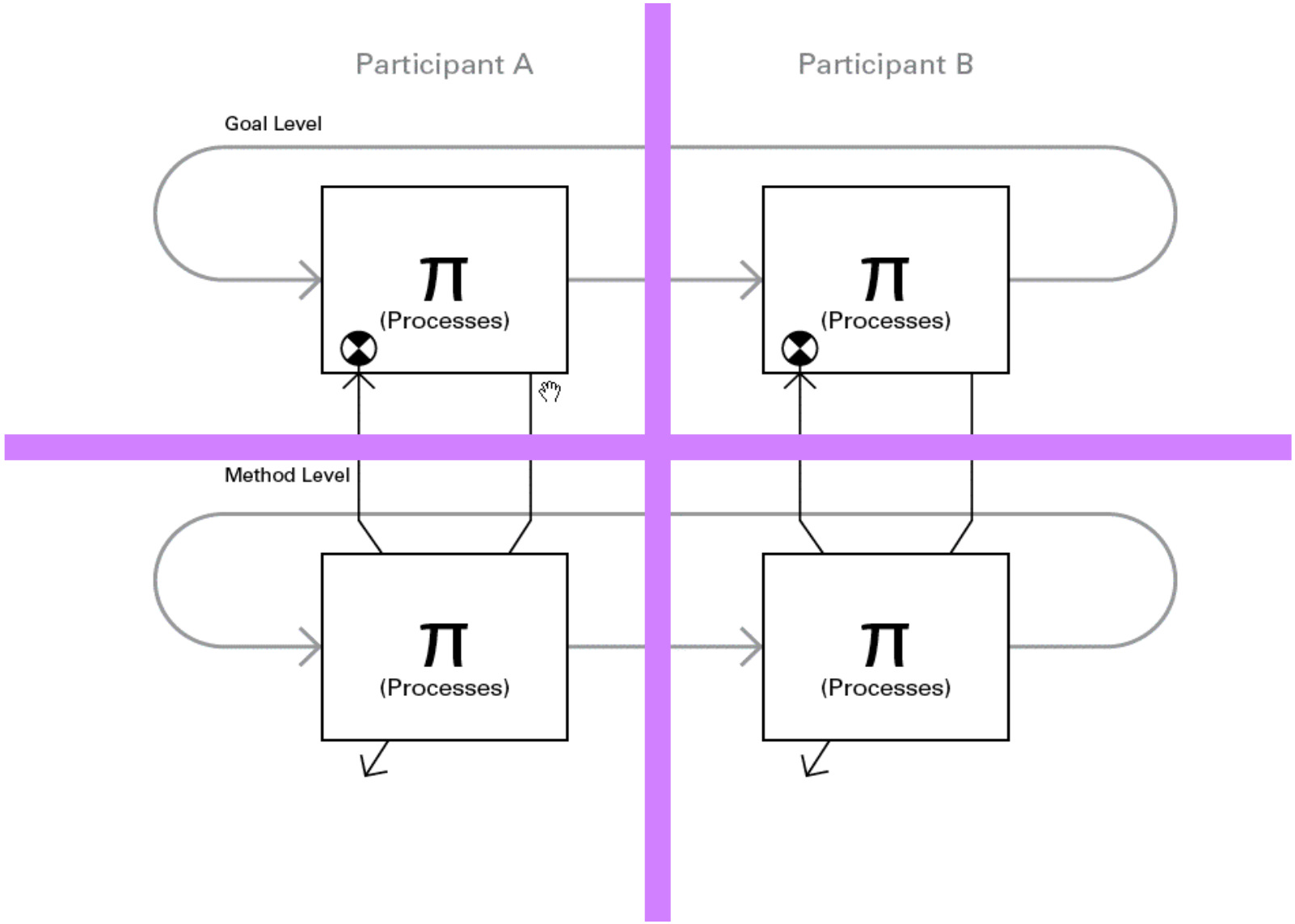
gordon pask—circular interactions—modeling



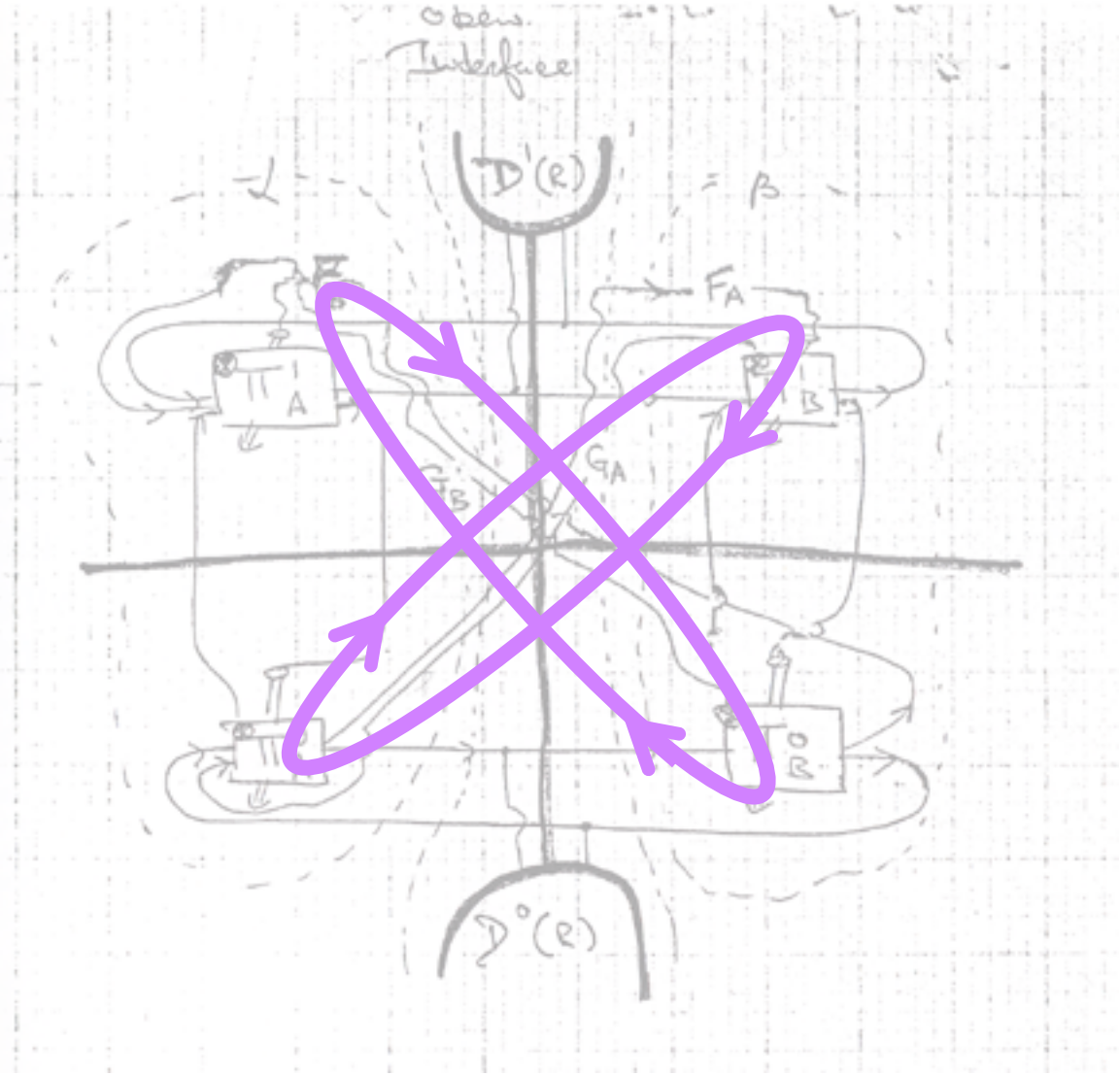
gordon pask—circular interactions—modeling



gordon pask—circular interactions—modeling



dance—contention—shared outcomes



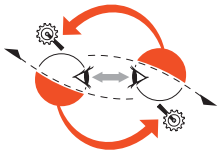
CONVERSATION

cybernetics reviewed

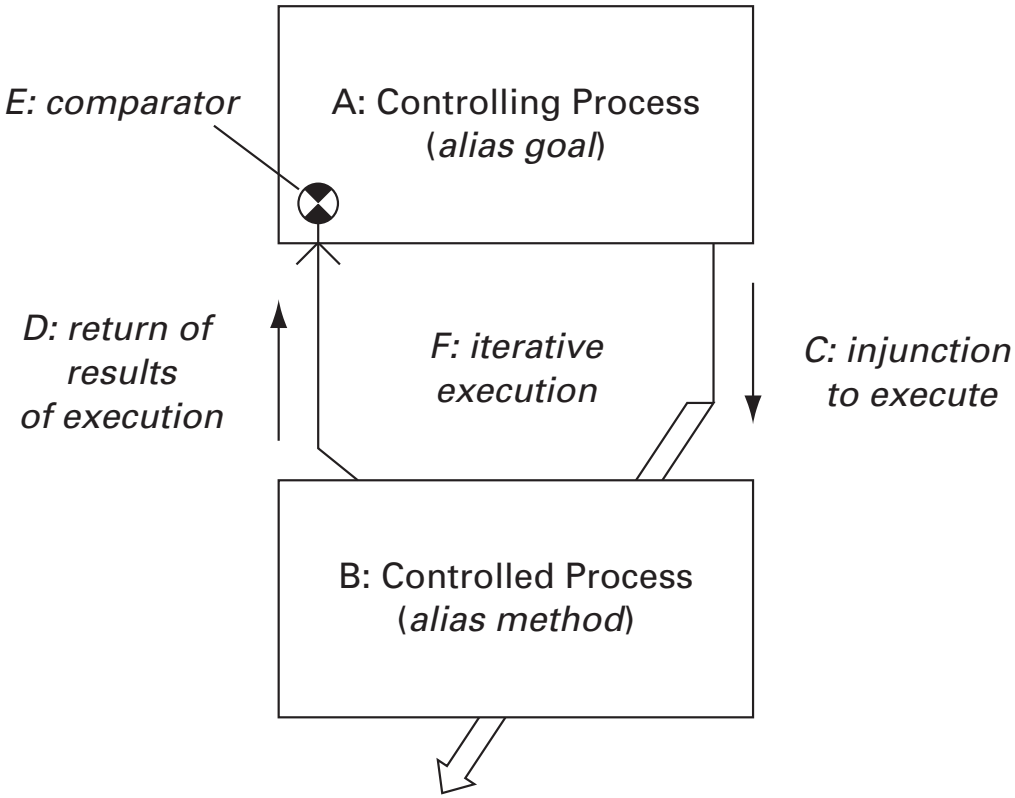
Gordon Pask

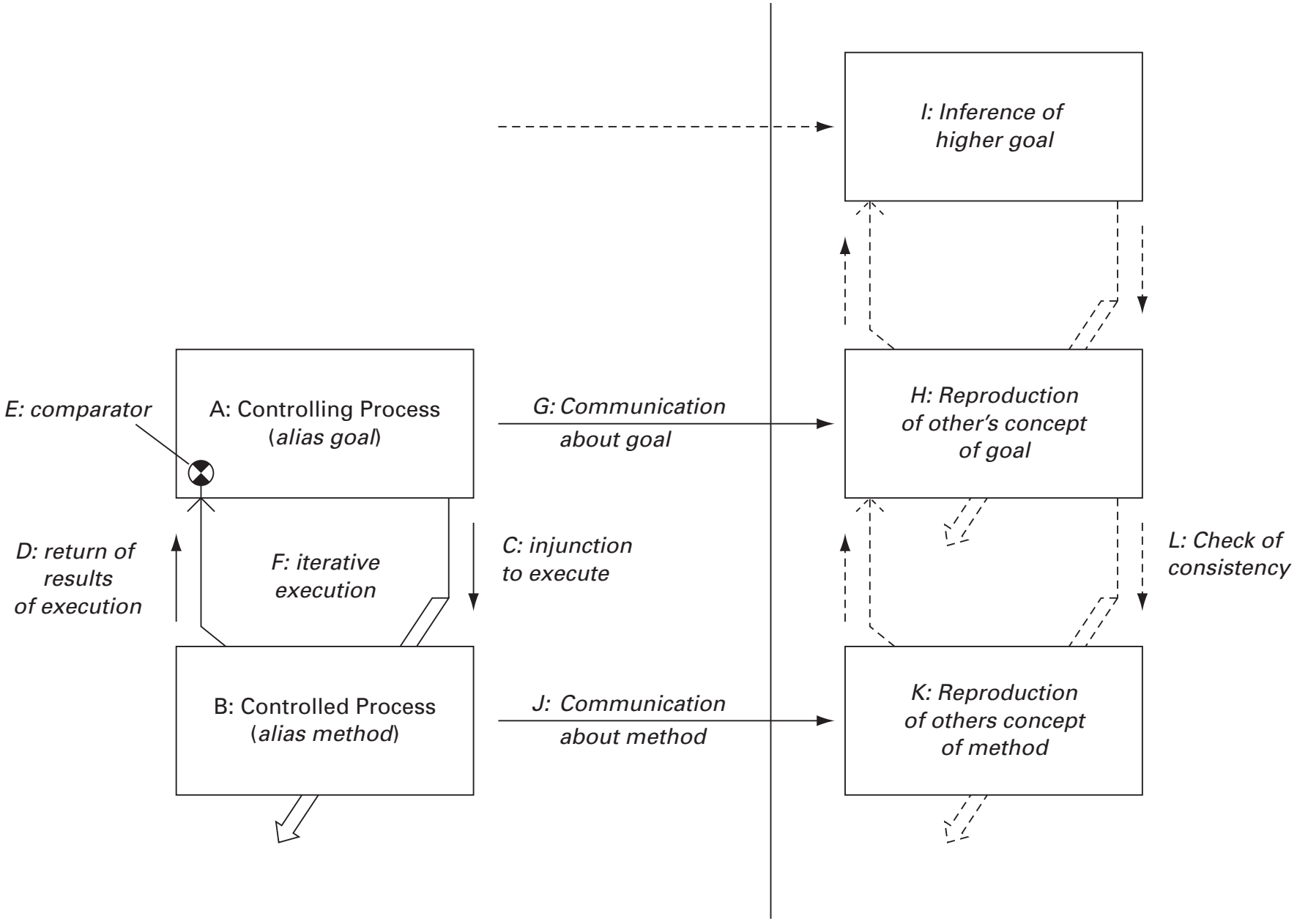
double-loop architectures

conversation theory

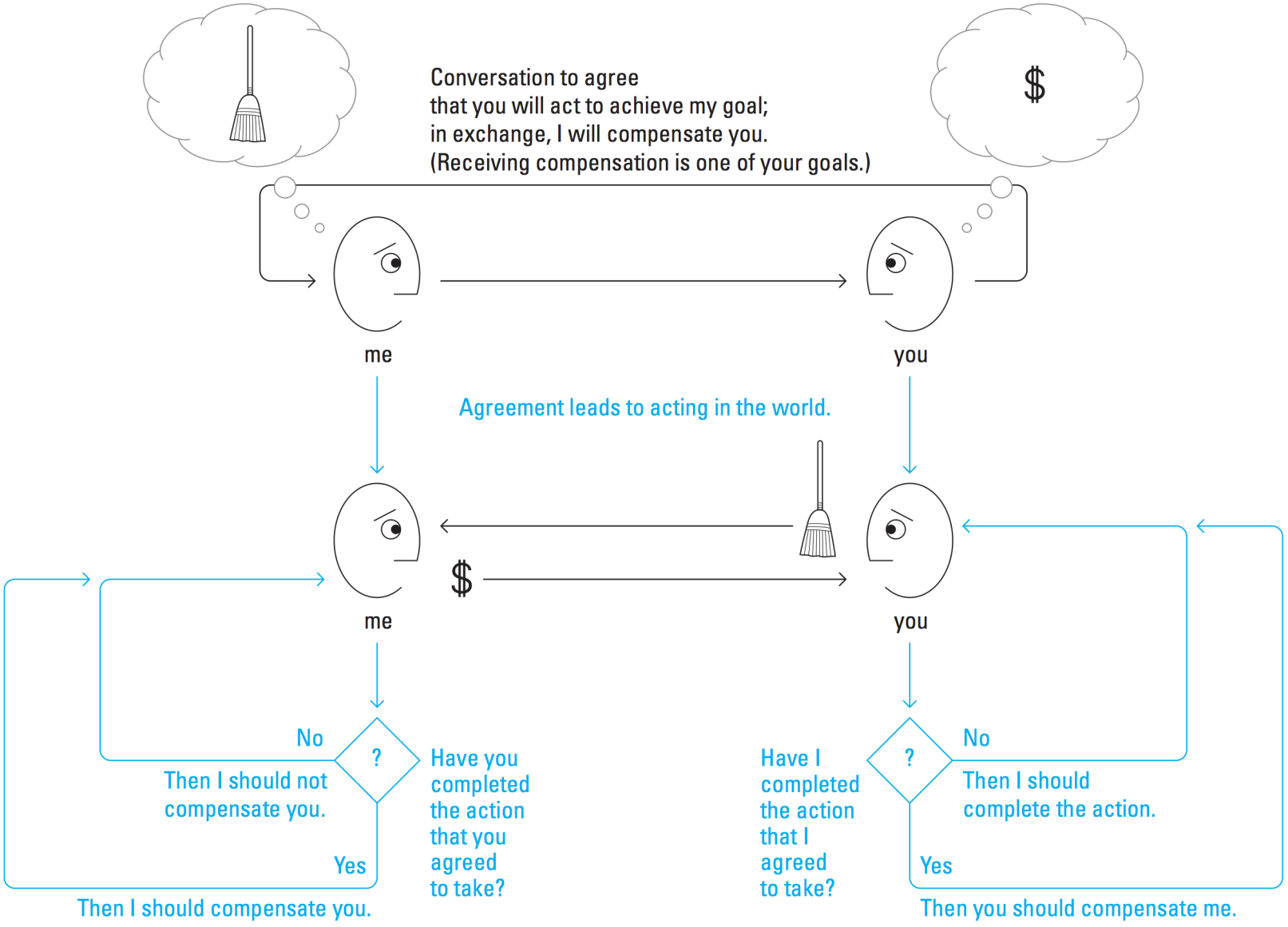


applications

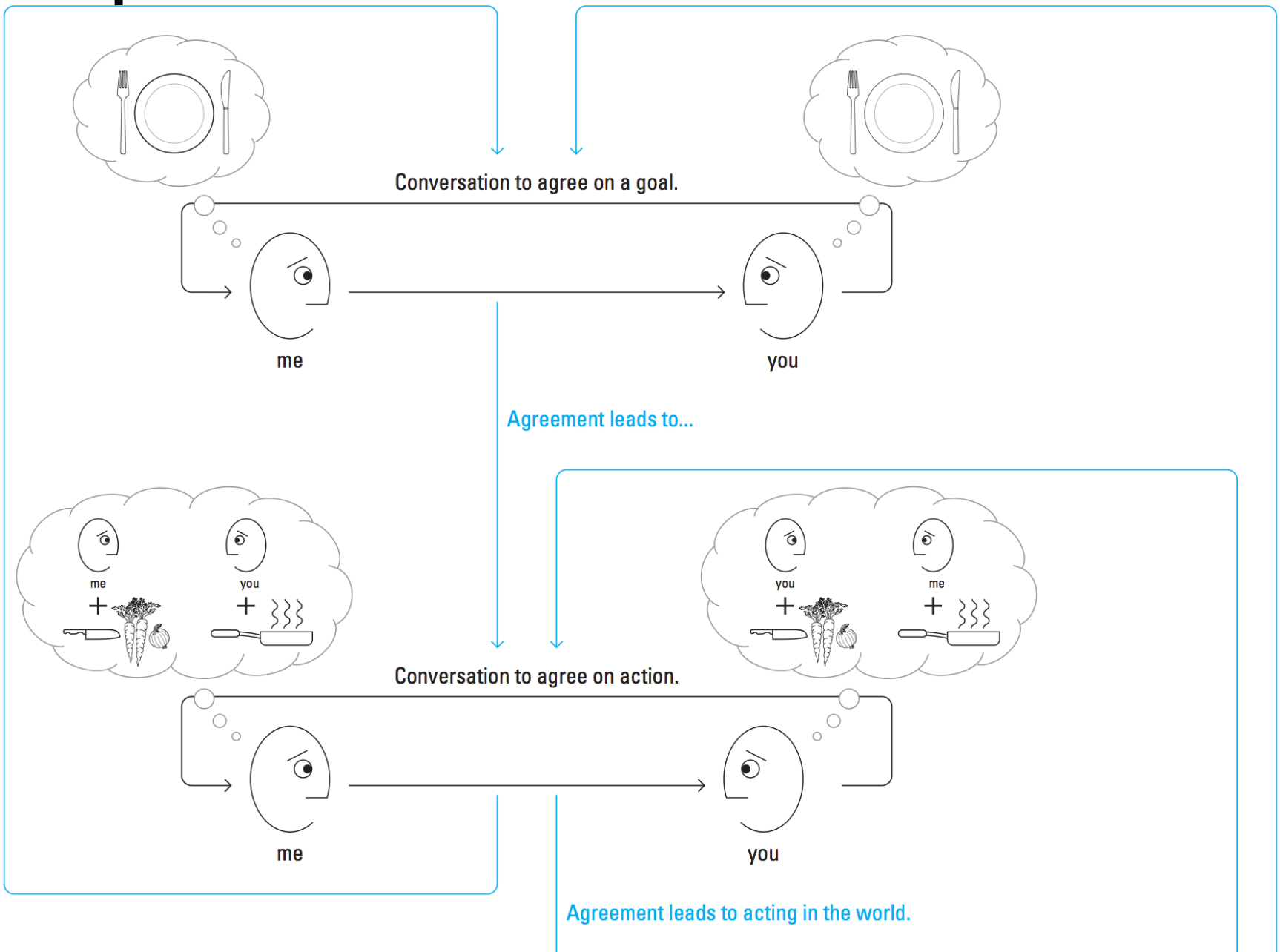

E: comparator
A: Controlling Process
(alias goal)
D: return of
results
of execution
F: iterative
execution
C: injunction
to execute
B: Controlled Process
(alias method)


I: Inference of higher goal
H: Reproduction of other's concept of goal
L: Check of consistency
K: Reproduction of others concept of method
E: comparator
A: Controlling Process (alias goal)
G: Communication about goal
D: return of results of execution
F: iterative execution
C: injunction to execute
B: Controlled Process (alias method)
J: Communication about method

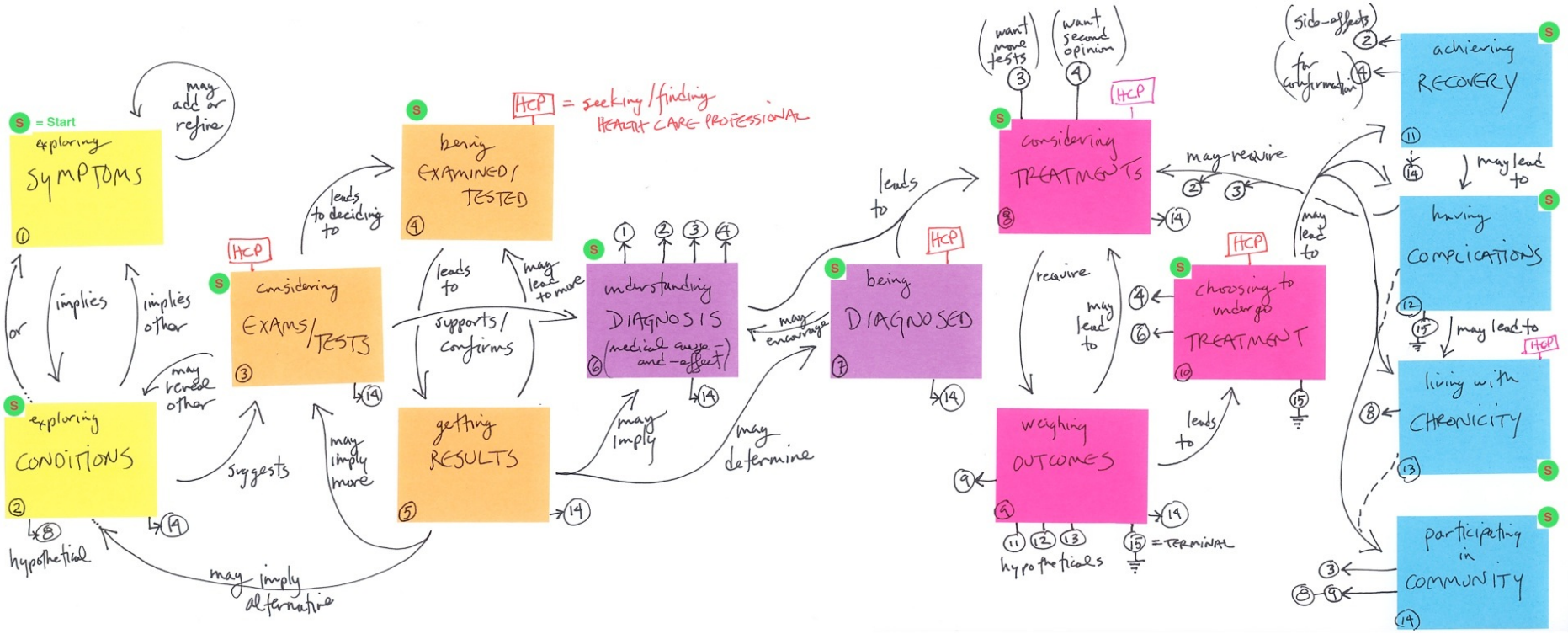
coöperation as coordination

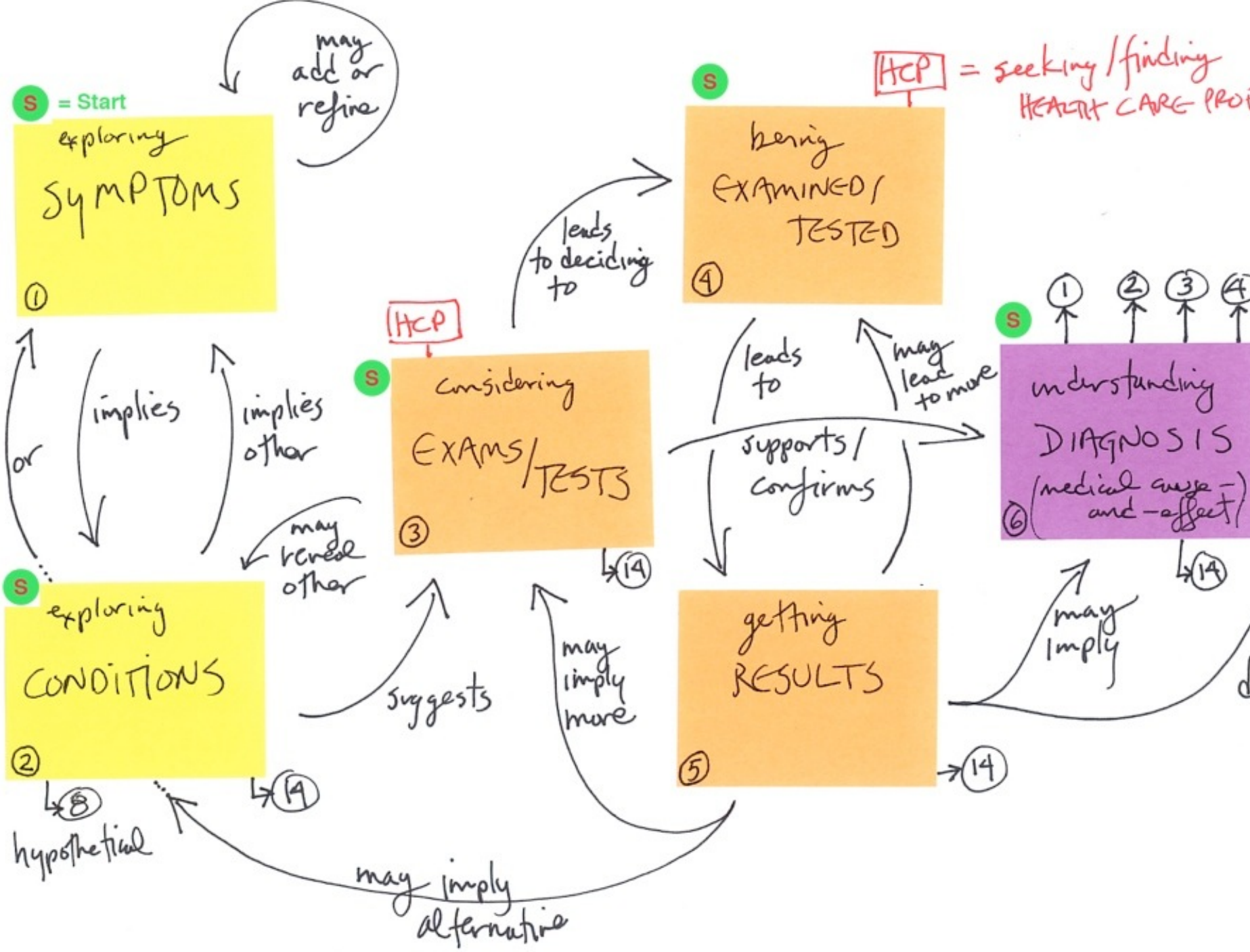


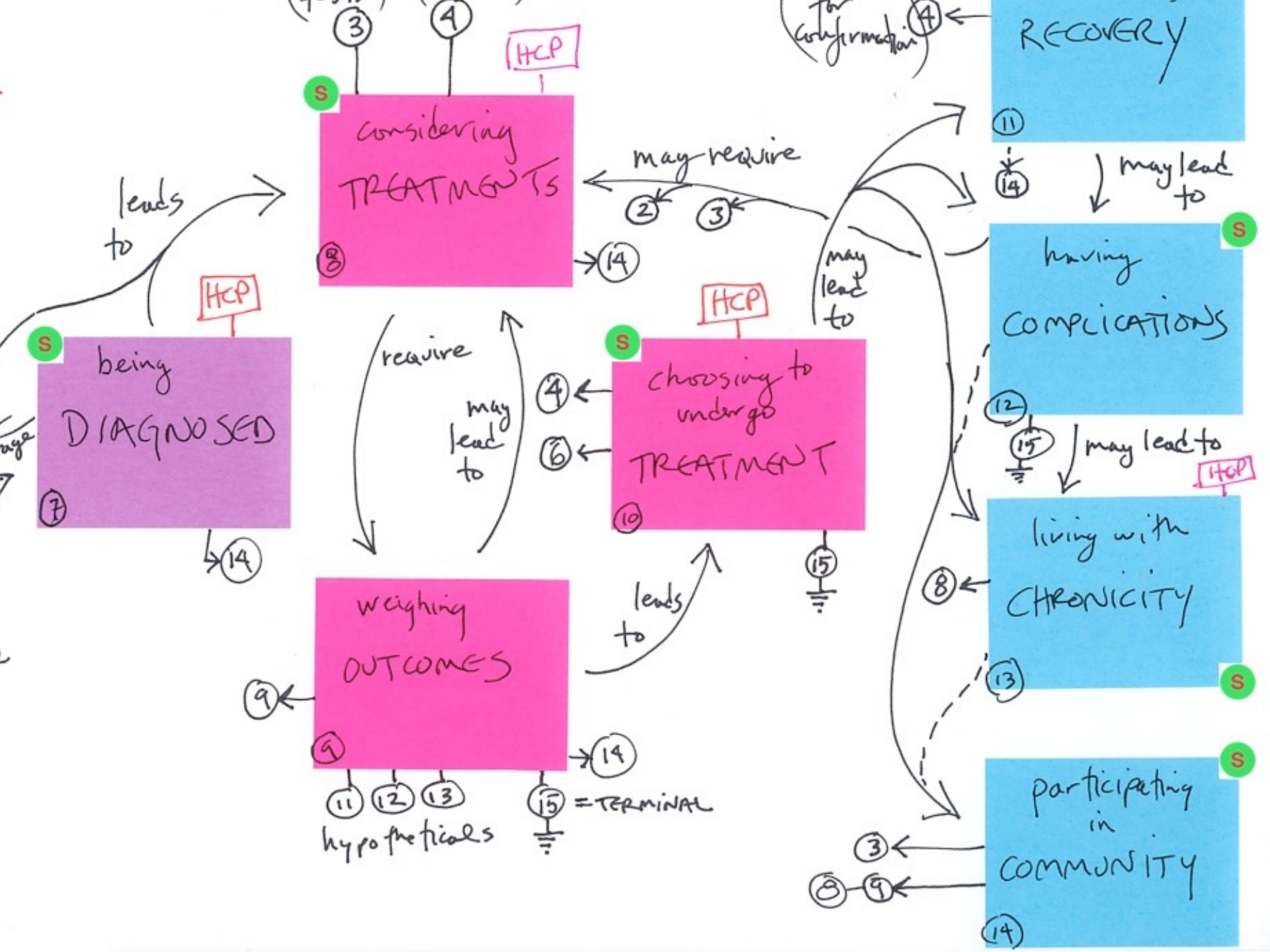
coöperation as collaboration



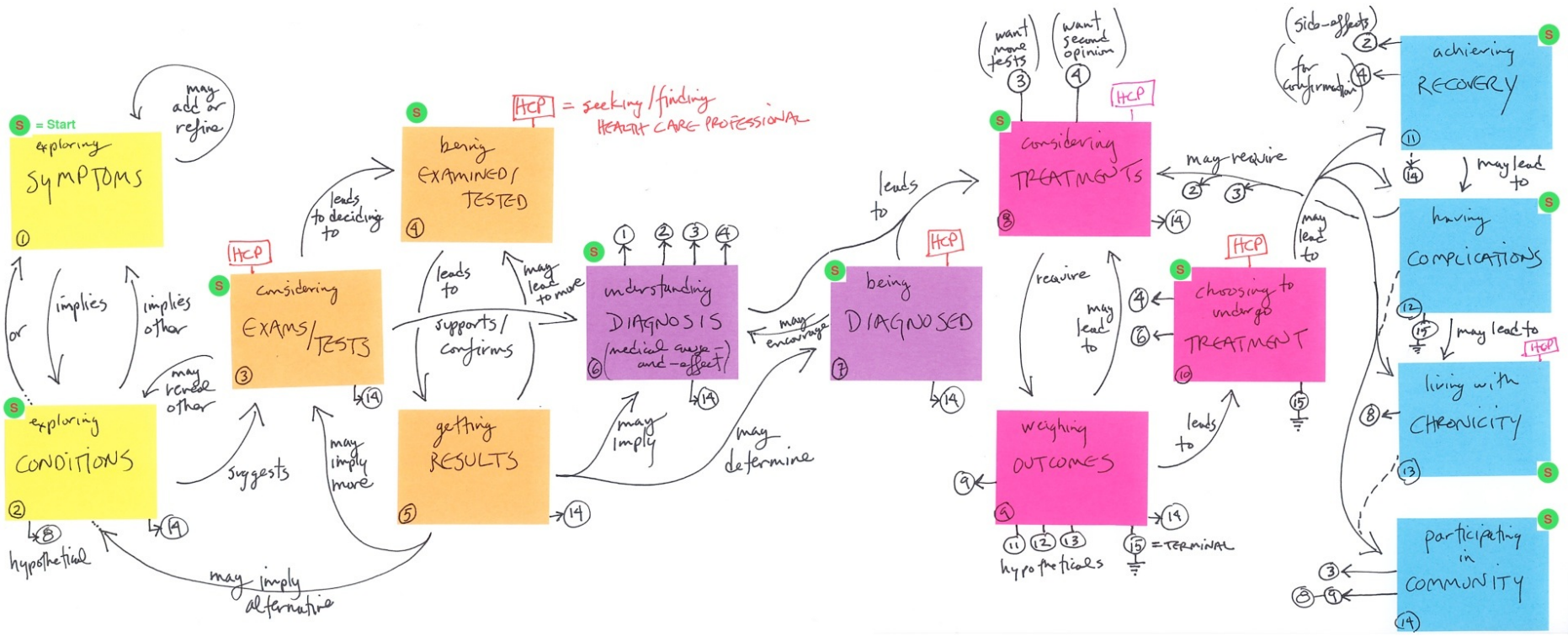
user interfaces / conversing with myself




S = Start
exploring
SYMPTOMS
1
may add or refine
HCP = seeking / finding
HEALTH CARE PROF
S
being
EXAMINED / TESTED
4
leads to deciding to
HCP
S
considering
EXAMS / TESTS
3
14
leads to
may lead to more
supports / confirms
S
understanding
DIAGNOSIS
(medical cause – and – effect)
6
14
1
2
3
4
or
implies
implies other
may reveal other
S
exploring
CONDITIONS
2
8
hypothetical
14
suggests
may imply more
getting
RESULTS
5
14
may imply
may imply alternative



RECOVERY
11
for confirmation
4
considering TREATMENTS
8
HCP
S
may require
2
3
14
may lead to
having COMPLICATIONS
12
15
may lead to
living with CHRONICITY
13
8
participating in COMMUNITY
14
3
8
9
may lead to
being DIAGNOSED
7
HCP
leads to
14
require
may lead to
choosing to undergo TREATMENT
10
4
6
15
weighing OUTCOMES
9
leads to
14
11
12
13
hypotheticals
15
= TERMINAL


S = Start
exploring SYMPTOMS
1
may add or refine
or
implies
implies other
may reveal other
exploring CONDITIONS
2
8 hypothetical
14
suggests
considering EXAMS/TESTS
HCP
3
14
leads to deciding to
being EXAMINED/TESTED
HCP = seeking/finding HEALTH CARE PROFESSIONAL
4
leads to
may lead to more
supports/confirms
may imply
getting RESULTS
5
14
may imply more
may imply alternative
understanding DIAGNOSIS (medical cure- and -affect)
1 2 3 4
6
14
may encourage
being DIAGNOSED
HCP
7
14
may determine
leads to
considering TREATMENTS
HCP
want more tests 3
want second opinion 4
8
14
may require 2 3
weighing OUTCOMES
9
14
11 12 13 15 = TERMINAL
hypotheticals
leads to
may lead to
receive
choosing to undergo TREATMENT
HCP
4 6
10
15
may lead to
side-effects 2
for confirmation 4
achieving RECOVERY
11
14
may lead to
having COMPLICATIONS
12
15
may lead to
living with CHRONICITY
HCP
8
13
participating in COMMUNITY
3
8 9
14

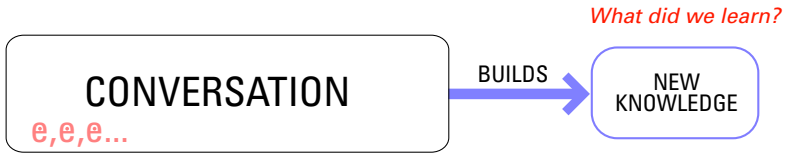
requisite variety

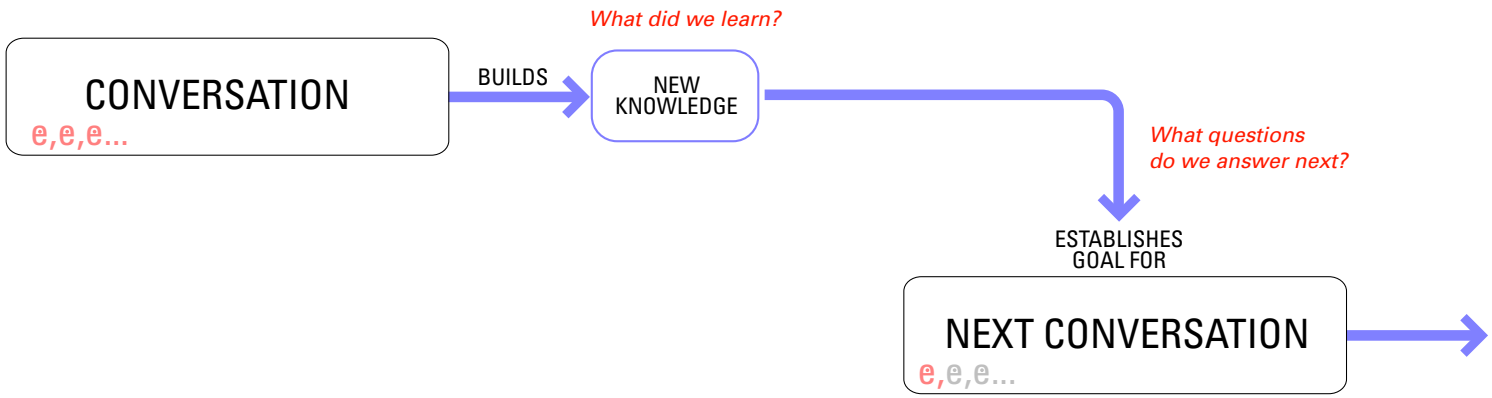
cybernetics has a rigorous definition
of the limitations of a system
to achieve its goal...

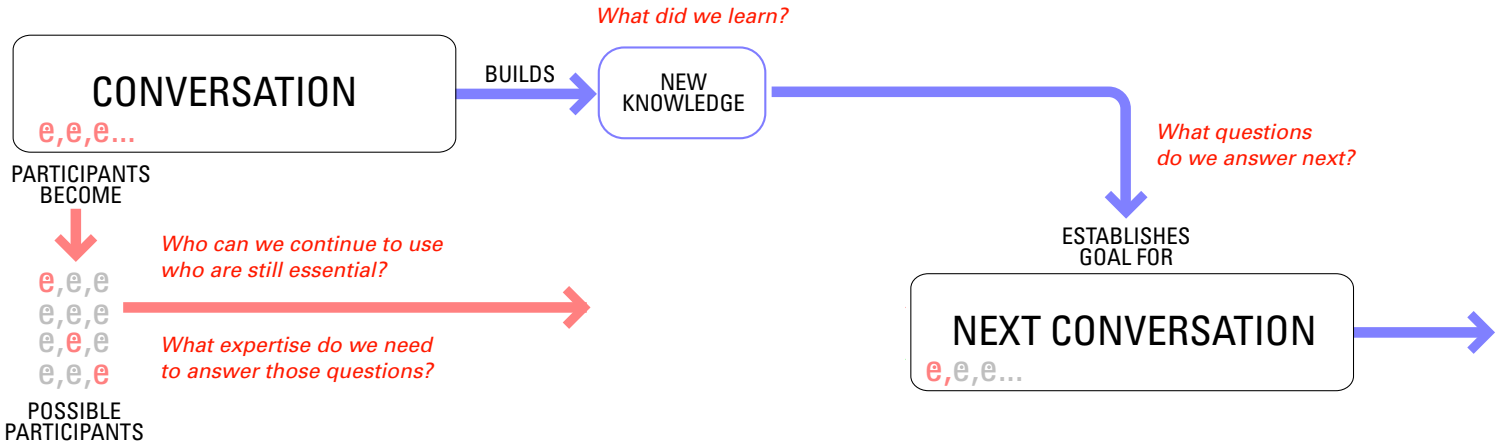
which can be applied to social systems

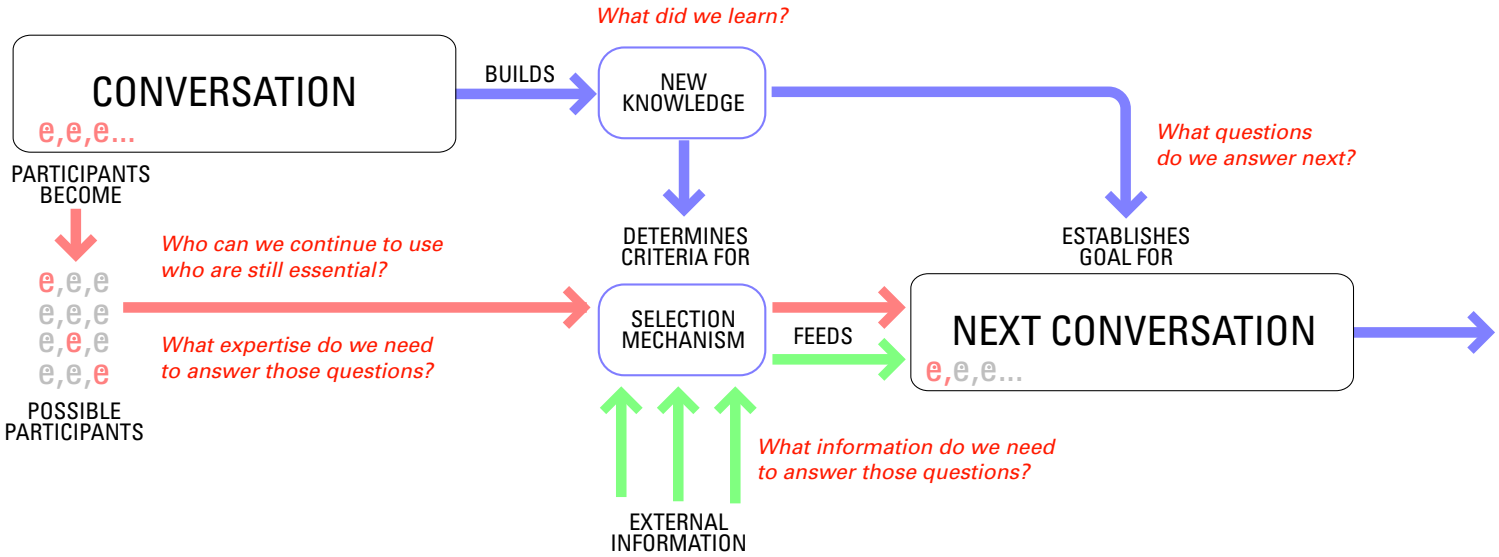
– variety is defined as capacity for conversation
– local truth controls the “essential variables” that determine the viability system

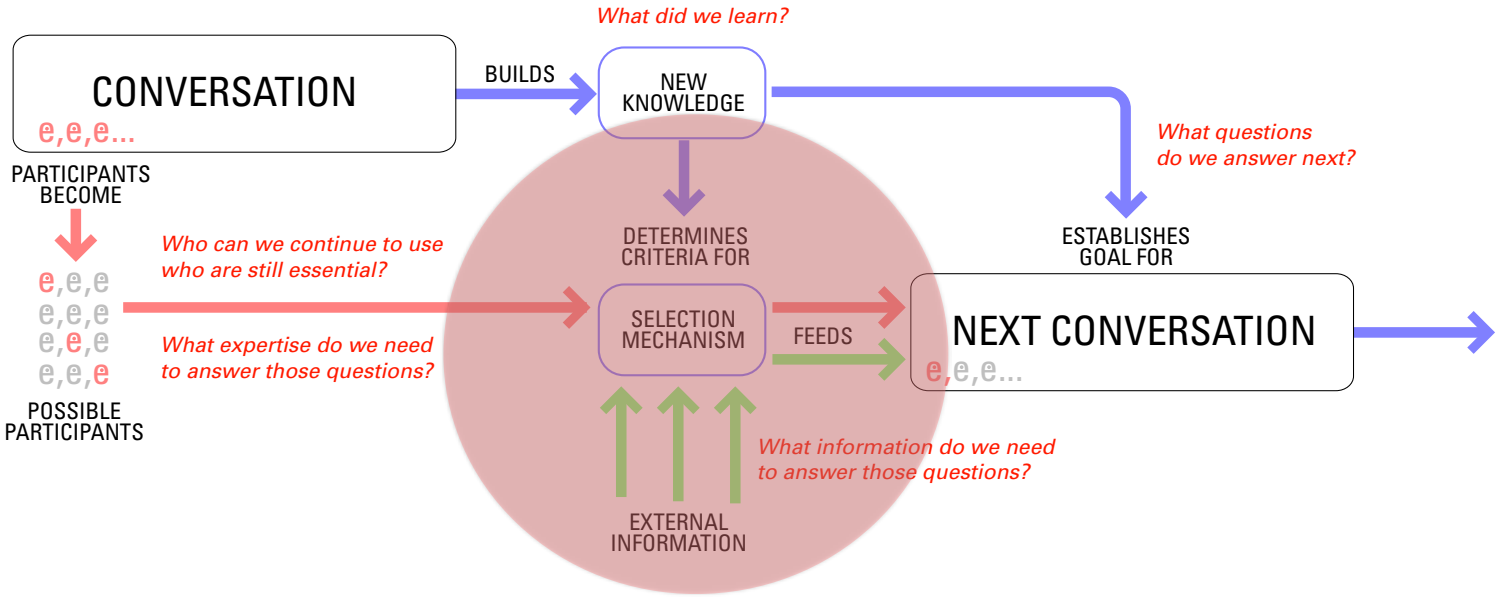
CONVERSATION
e,e,e...


What did we learn?
CONVERSATION
e,e,e...
BUILDS
NEW
KNOWLEDGE

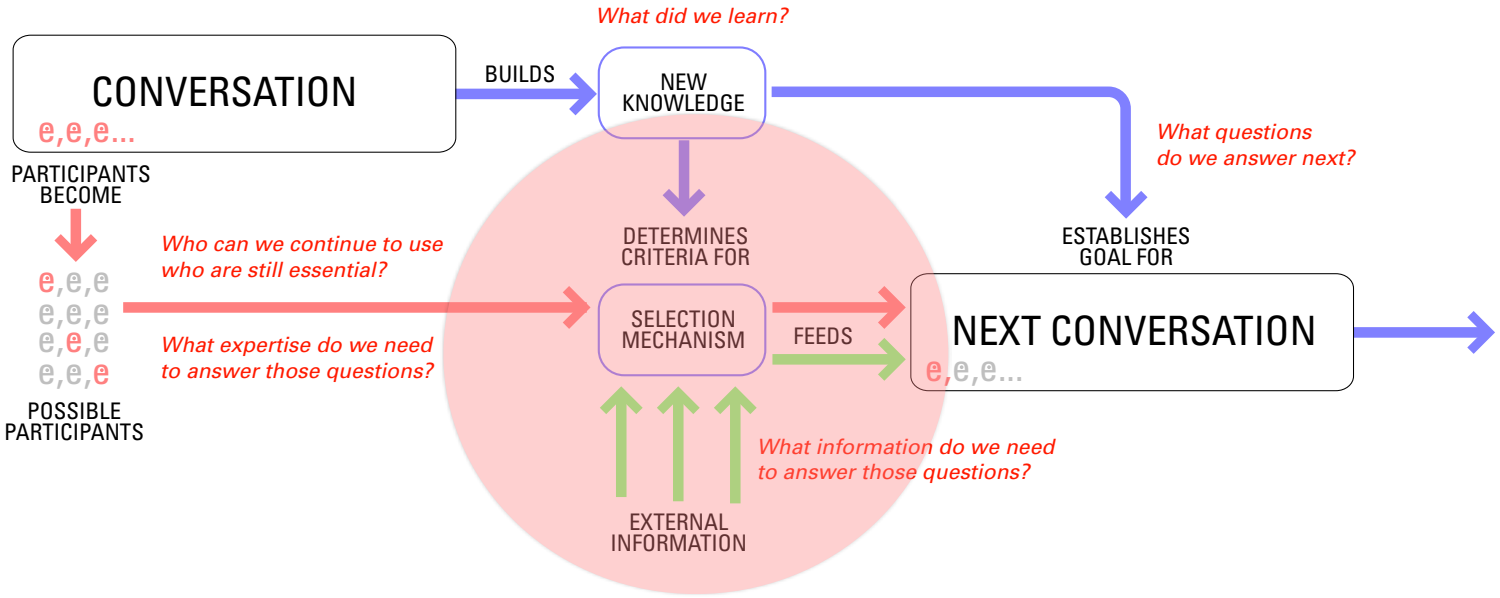

CONVERSATION
e,e,e...
BUILDS
What did we learn?
NEW KNOWLEDGE
What questions do we answer next?
ESTABLISHES GOAL FOR
NEXT CONVERSATION
e,e,e...


CONVERSATION
e,e,e...
BUILDS
What did we learn?
NEW KNOWLEDGE
What questions do we answer next?
ESTABLISHES GOAL FOR
NEXT CONVERSATION
e,e,e...
PARTICIPANTS BECOME
e,e,e
e,e,e
e,e,e
e,e,e
POSSIBLE PARTICIPANTS
Who can we continue to use who are still essential?
What expertise do we need to answer those questions?

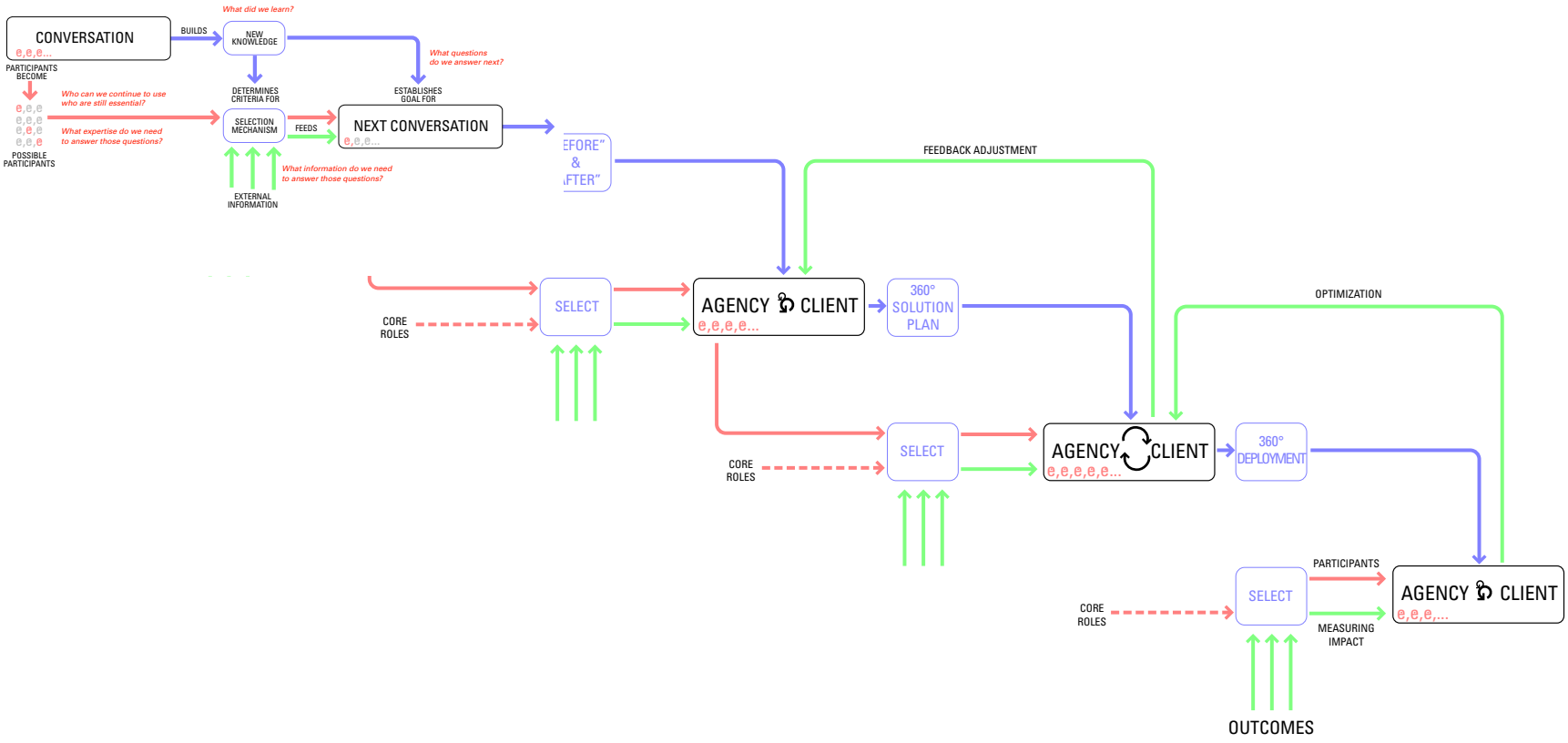

What did we learn?
CONVERSATION
e,e,e...
BUILDS
NEW KNOWLEDGE
What questions do we answer next?
PARTICIPANTS BECOME
DETERMINES CRITERIA FOR
ESTABLISHES GOAL FOR
Who can we continue to use who are still essential?
e,e,e
e,e,e
e,e,e
e,e,e
SELECTION MECHANISM
FEEDS
NEXT CONVERSATION
e,e,e...
What expertise do we need to answer those questions?
POSSIBLE PARTICIPANTS
What information do we need to answer those questions?
EXTERNAL INFORMATION

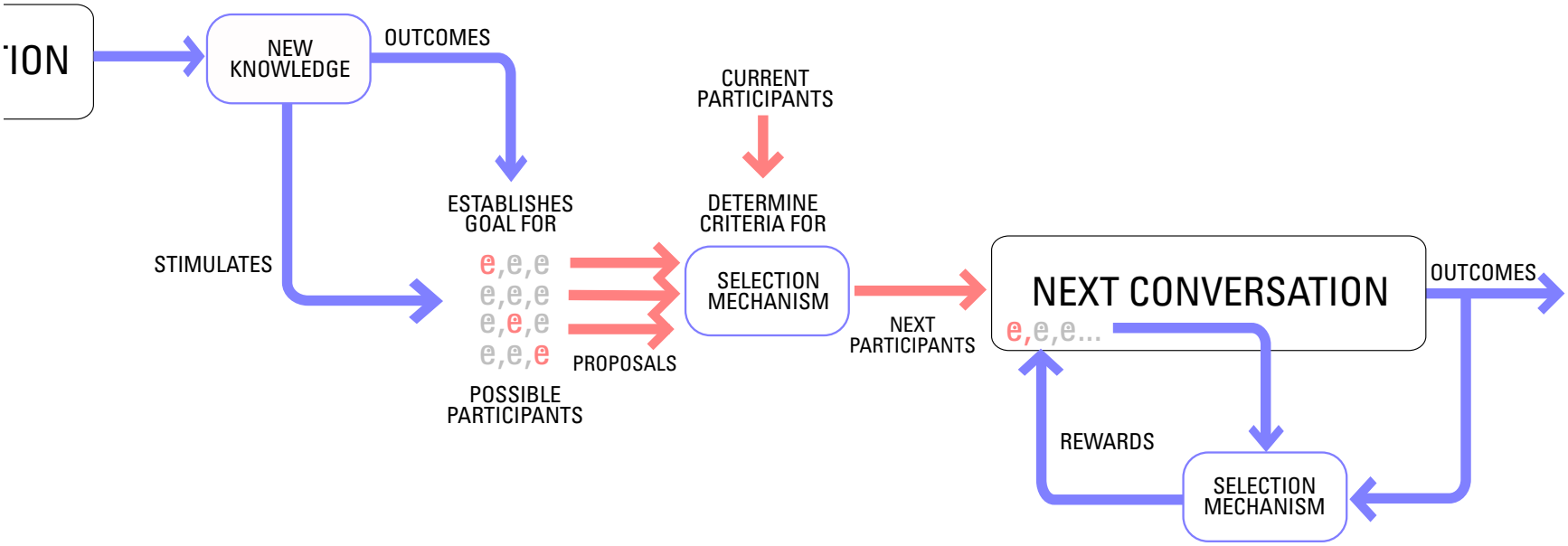

CONVERSATION
e,e,e...
PARTICIPANTS BECOME
e,e,e
e,e,e
e,e,e
e,e,e
POSSIBLE PARTICIPANTS
BUILDS
What did we learn?
NEW KNOWLEDGE
What questions do we answer next?
DETERMINES CRITERIA FOR
ESTABLISHES GOAL FOR
Who can we continue to use who are still essential?
What expertise do we need to answer those questions?
SELECTION MECHANISM
FEEDS
NEXT CONVERSATION
e,e,e...
What information do we need to answer those questions?
EXTERNAL INFORMATION

designing the cadence of conversations



solution delivery evaluation




TION
NEW KNOWLEDGE
OUTCOMES
STIMULATES
ESTABLISHES GOAL FOR
e,e,e
e,e,e
e,e,e
e,e,e
PROPOSALS
POSSIBLE PARTICIPANTS
CURRENT PARTICIPANTS
DETERMINE CRITERIA FOR
SELECTION MECHANISM
NEXT PARTICIPANTS
NEXT CONVERSATION
e,e,e...
OUTCOMES
REWARDS
SELECTION MECHANISM

co-evolution

cybernetics models the subjective and objective interactions inherent in any complex system that includes social / linguistic components

Notes on the Role of **Leadership and Language** in Regenerating Organizations

An organization is its **language.**

Ultimately,
an organization consists of conversations:
who talks to whom, about what.

Each conversation
is recognized, selected, and amplified
(or ignored) by the system.
Decisions, actions, and a sense of valid purpose
grow out of these conversations.

Conversation leads to agreement.
Agreement leads to transaction.

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Narrowing **language** increases efficiency.

Organizations create their own internal language
to solve specific problems.

This language serves as a kind of shorthand:
Managers use it every day,
knowing they will be clearly understood.

Over time, this internal language
grows increasingly specialized—and narrow.

Organizations create their own internal language
to solve specific problems.

This language serves as a kind of shorthand:
Managers use it every day,
knowing they will be clearly understood.

This internal language is designed to address
the needs of the present-day business.
It helps the organization's managers
answer familiar questions
and thus increases efficiencies.

Over time, this internal language
grows increasingly specialized—and narrow.

Narrowing **language** also increases ignorance.

The organization's internal language
is designed to help managers
facilitate present-day business—not look beyond it.

Using the internal language,
managers increase efficiencies,
but cannot recognize new fields of research,
new discoveries, new approaches.

e.

The organization's internal language
is designed to help managers
facilitate present-day business — not look beyond it.

Using the internal language,
managers increase efficiencies,
but cannot recognize new fields of research,
new discoveries, new approaches.

Past **language** limits future vision.

Managers understand the organization's past behavior.
But this knowledge,
and the language that accompanies it,
limit their vision
of the organization's potential future state.

Using the language of the past,
managers may try to provide a vision for the future.
But it is an old future—
a memory of what the future could be.

Managers may strive for fundamental change,
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Expanding **language** increases opportunity.

The conversations necessary
for generating new opportunities
come from outside the system.

For an organization to survive,
it must be able to acquire
new, relevant language domains.

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To regenerate, an organization creates a new **language.**

To support an organization's future viability, effective decision makers actively introduce change into the system.

They do so by generating new language that appropriate groups in the organization come to understand and embrace.

This new language does not overtly challenge the pre-existing, efficient system, but rather creates new distinctions and supportive relationships.

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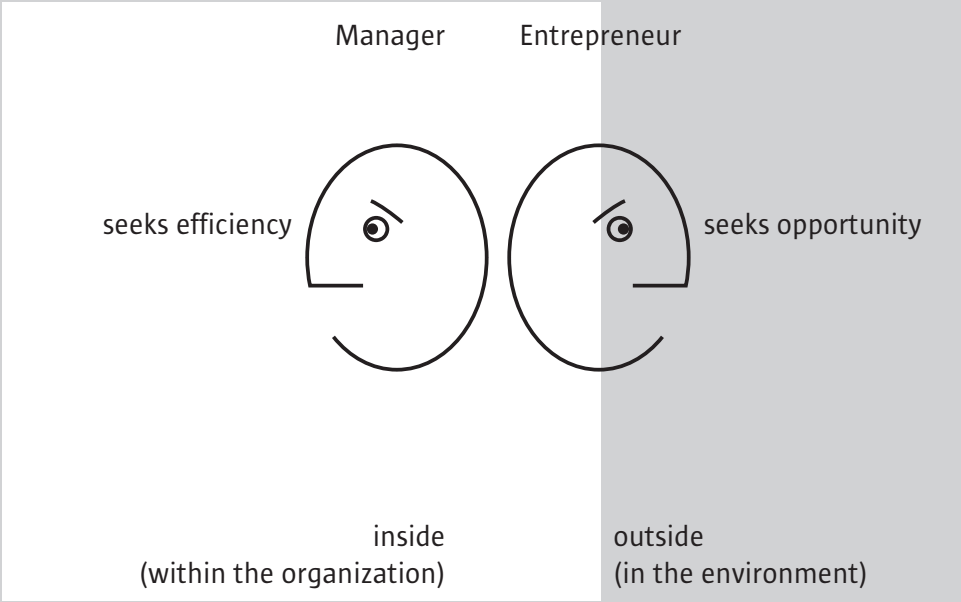
Manager and Entrepreneur.

The Manager is responsible for improving
the organization's present-day performance.
Acting in what he perceives to be his own self-interest,
he uses the organization's current language
to improve efficiencies.

The Entrepreneur does not concern herself
with present-day business.
Acting in what she perceives to be her own self-interest,
she strives to ensure the organization's future
by facilitating its evolution.



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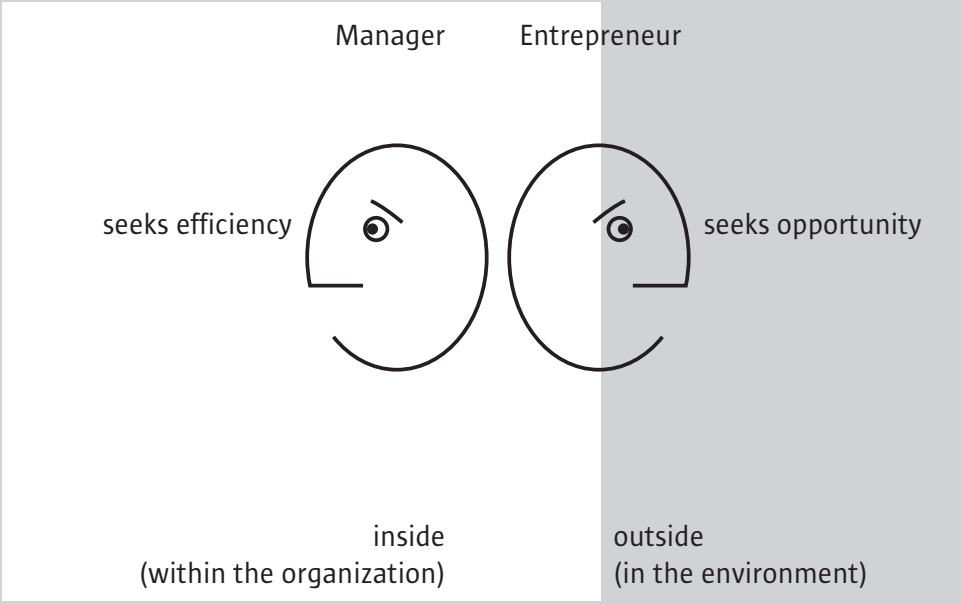

Managers' reaction to Entrepreneurs' language:

"Don't distract me with future problems."

"That's a waste of time."

"Stop taking resources away from what's important."

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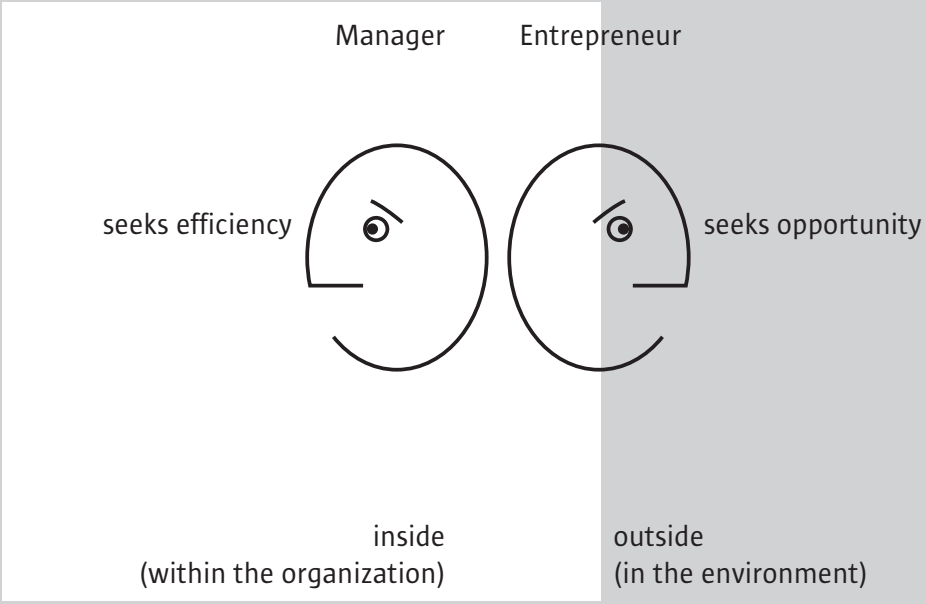

Entrepreneurs' reaction to
Managers' language:

"You are stuck in the past."

"What you want to do is
no longer relevant."

"Stop taking resources away
from what's important."

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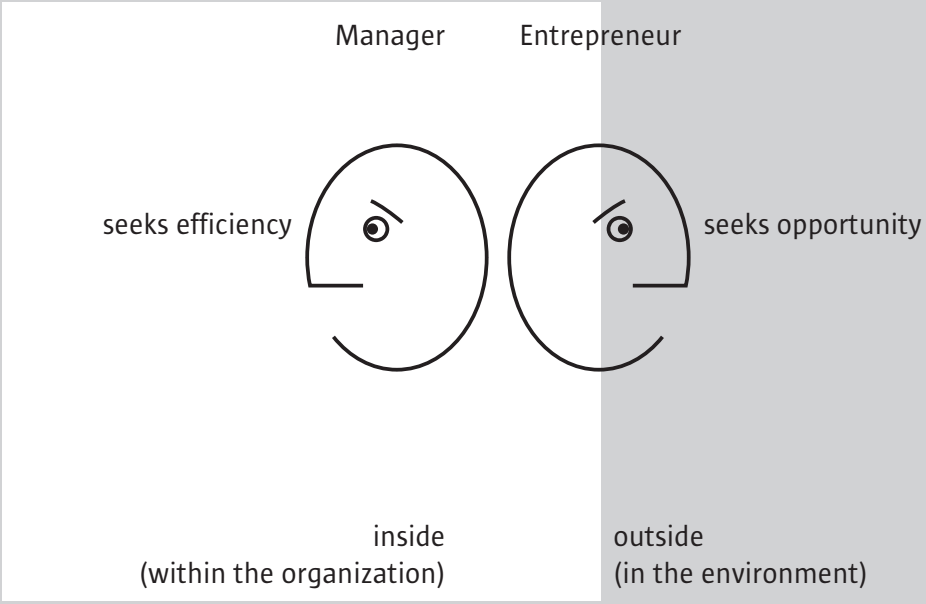


But...

Managers and Entrepreneurs
are both necessary for the
long-term viability of an organization.

Managers' language improves quality,
brings about efficiencies, and
focuses on today.

Entrepreneurs' language increases variety,
fosters insight, and
focuses on tomorrow.

Notes on the Role of **Leadership and Language** in Regenerating Organizations

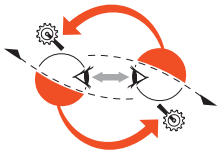
CONVERSATION

cybernetics reviewed

Gordon Pask

double-loop architectures

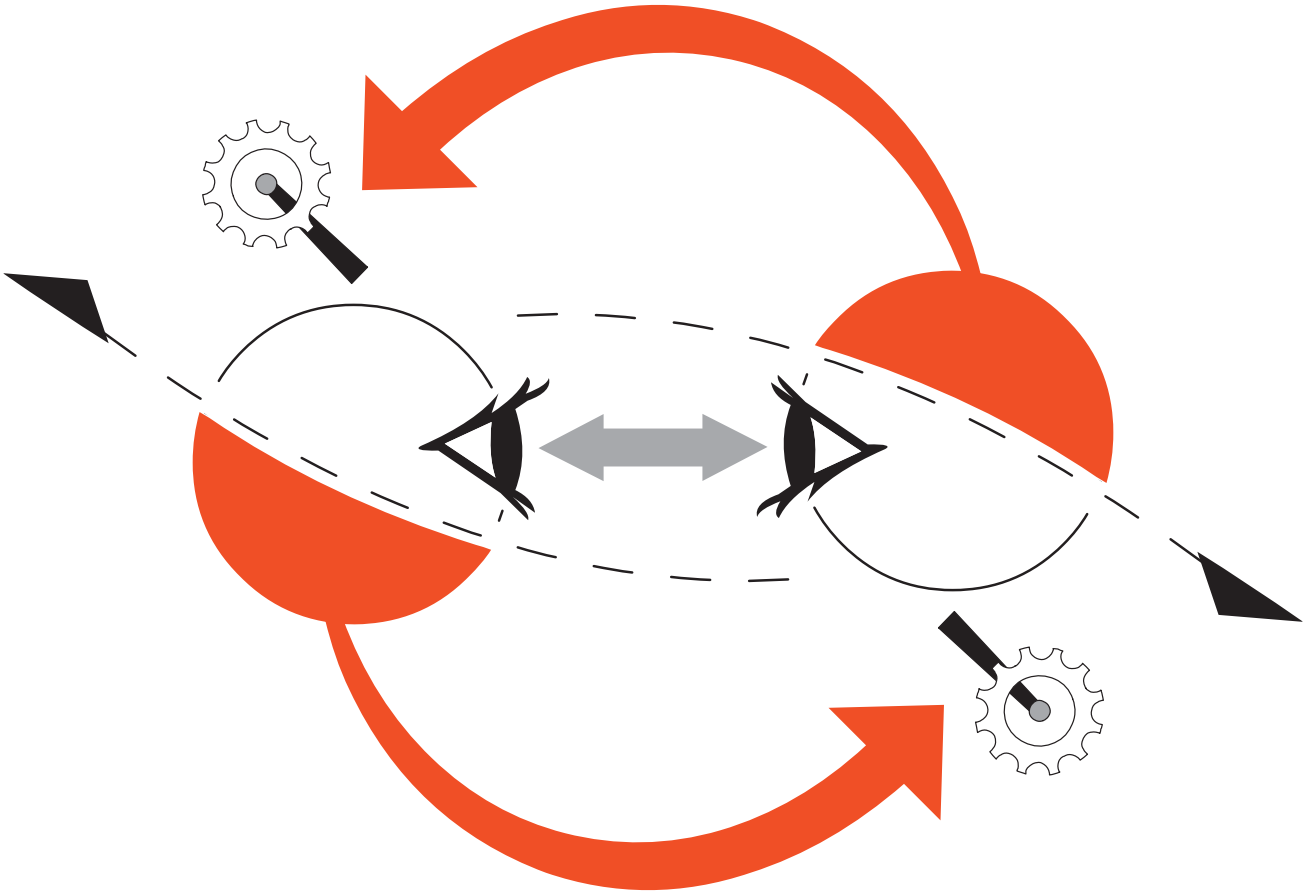
conversation theory



applications

CYBERNETICS CONVERSATION DESIGN

CUSO SEMINAR — University of Fribourg
Dr Paul Pangaro — New York City
November 2014



pangaro@generalcybernetics.net