

The Design of Ethical Interfaces

pangaro.com/hciiseminar2019/

Paul Pangaro
Professor of Practice

HCII Seminar Series
Human-Computer Interaction Institute
Carnegie Mellon University
April 2019

The Design of Ethical Interfaces

pangaro.com/hciiseminar2019/

The Design of Ethical Interfaces

The Design of Ethical Interfaces

Organizing Principle

“I shall act always...”

The Design of Ethical Interfaces

Organizing Principle

“I shall act always so as to increase...”

The Design of Ethical Interfaces

Organizing Principle

“I shall act always so as to increase the total number of choices.”

The Design of Ethical Interfaces

Organizing Principle

“I shall act always so as to increase the total number of **choices**.”

The Design of Ethical Interfaces

Organizing Principle

“I shall act always so as to increase the total number of choices.”

The Design of Ethical Interfaces

Organizing Principle

“I shall act always so as to increase the total number of choices.”

— Heinz von Foerster

Click for PDF of “Ethics and Second-Order Cybernetics”, 1991

The Design of Ethical Interfaces

Organizing Principle

“I shall act always so as to increase the total number of choices.”

— **Ethical Imperative**, Heinz von Foerster

Click for PDF of “Ethics and Second-Order Cybernetics”, 1991

The Design of Ethical Interfaces

Ethical Interfaces — Axiom #1

“As a designer, I shall act always so as to increase the total number of choices for a user.”

— Ethical Imperative, Interaction Designers

What the hell does this mean? How do we do this?

Interface Quandry #1

a. Recommendation Engines

***Recommendations are based on who the user **was**
— recommendations are based on the **past**.***

At worst, the interface presumes a **non-evolving, non-living user**.

Interface Quandry #1

b. Search Engines

***Search results are based on who the user **was**
– search results are grounded in the **past**.***

Search results are “of the past” – they are “dead on arrival.”

Interface Quandry #1

Recommendations & Search Results = Looking Backward

*These engines deliver outcomes based on the **past** —
treating us as we **used to be**, as if we are **dead**.*

Questions are alive — questions are “of the now”.

How would a user manifest as *alive* in these interactions?

I. Treat Users as Alive & Evolving

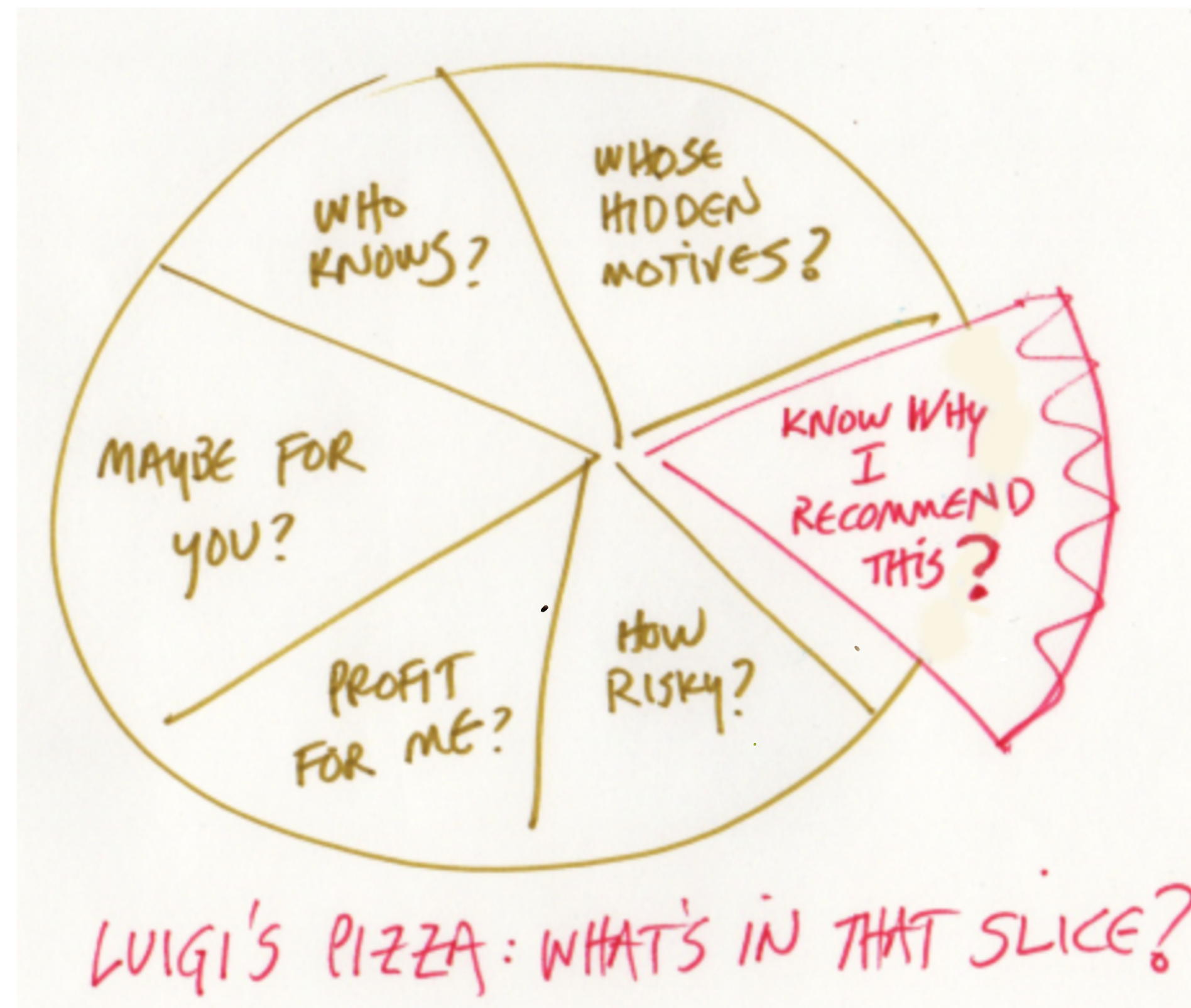
Design Prototype #1: Build Question Engines

*Compute relevant questions that invite a **generative conversation** such that novel, forward-seeing choices may be explored.*

The Design of Ethical Interfaces

Interface Quandry #2

Luigi's Pizza — A Parable



[Click for more about Luigi's Pizza](#)

II. Give Users Equal Agency

Design Prototype #2 — Universal Dialog UI

Always incorporate a **dialogical interface** so that a user can question the computed offering of any recommendation or result.

“Why did you recommend that? Where did that result come from?”

“Did you consider this (objective) factor or this (subjective) concern?”

III. Guide Users to Valuable Conversations

Design Prototype #3 — “Intelligent Conversation” Metric

Implement a heuristic to evaluate a conversation in terms of its intelligence and value, in order to draw human attention to generative interactions.

In contrast to the “Turing Test, let’s build a “Turning Test.”

[Click for more](#)

The Design of Ethical Interfaces

Design & Prototyping – Research Questions

#1. Question Engine – Do users evolve better understanding?

#2. Universal Dialog UI – Do users increase their agency?

#3. Turning Test – Do users improve their focus of attention?

The Design of Ethical Interfaces

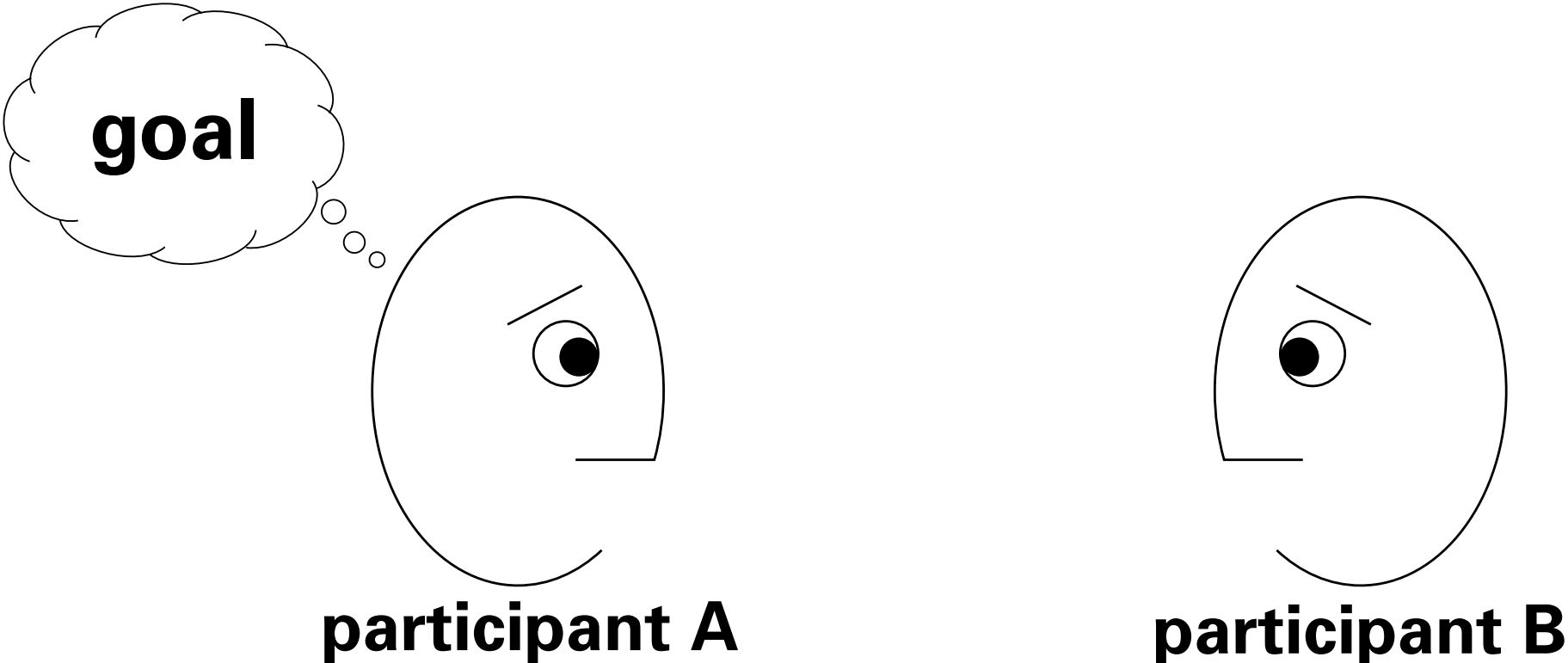
Design & Prototyping – Research Questions

#1. Question Engine – Do users evolve better understanding?

#2. Universal Dialog UI – Do users increase their agency?

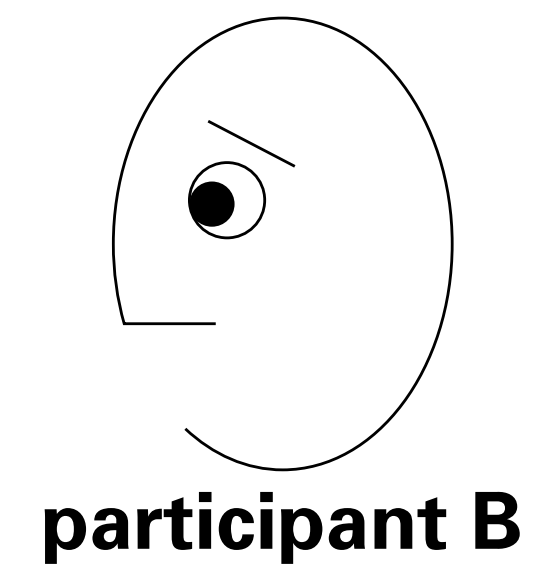
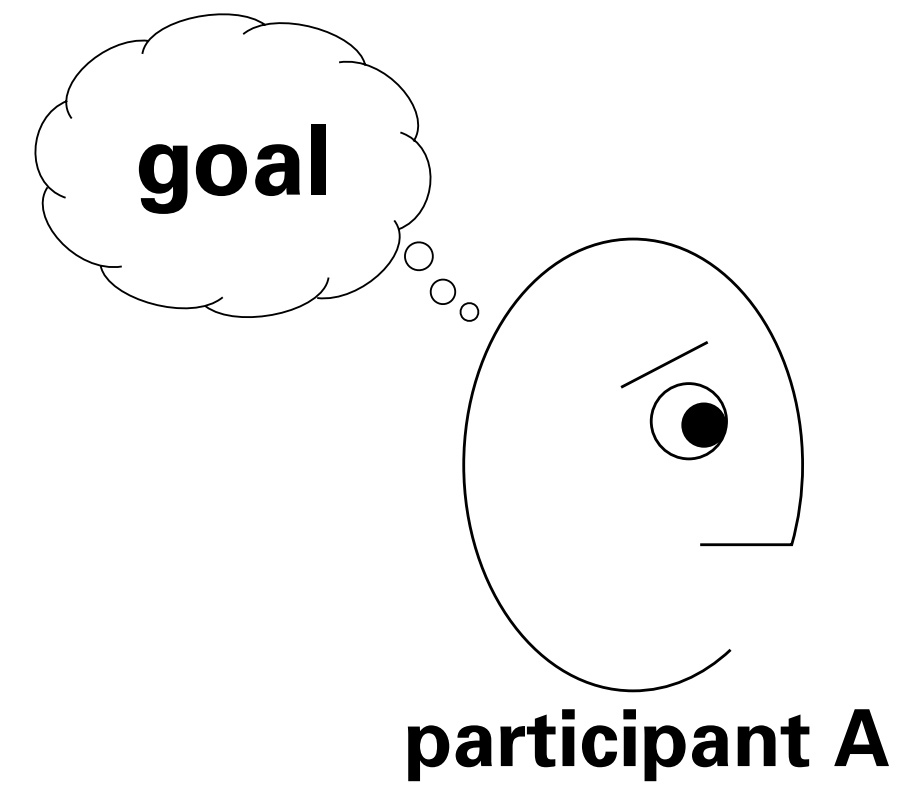
#3. Turning Test – Do users learn from the conversation?

Conversational Frame

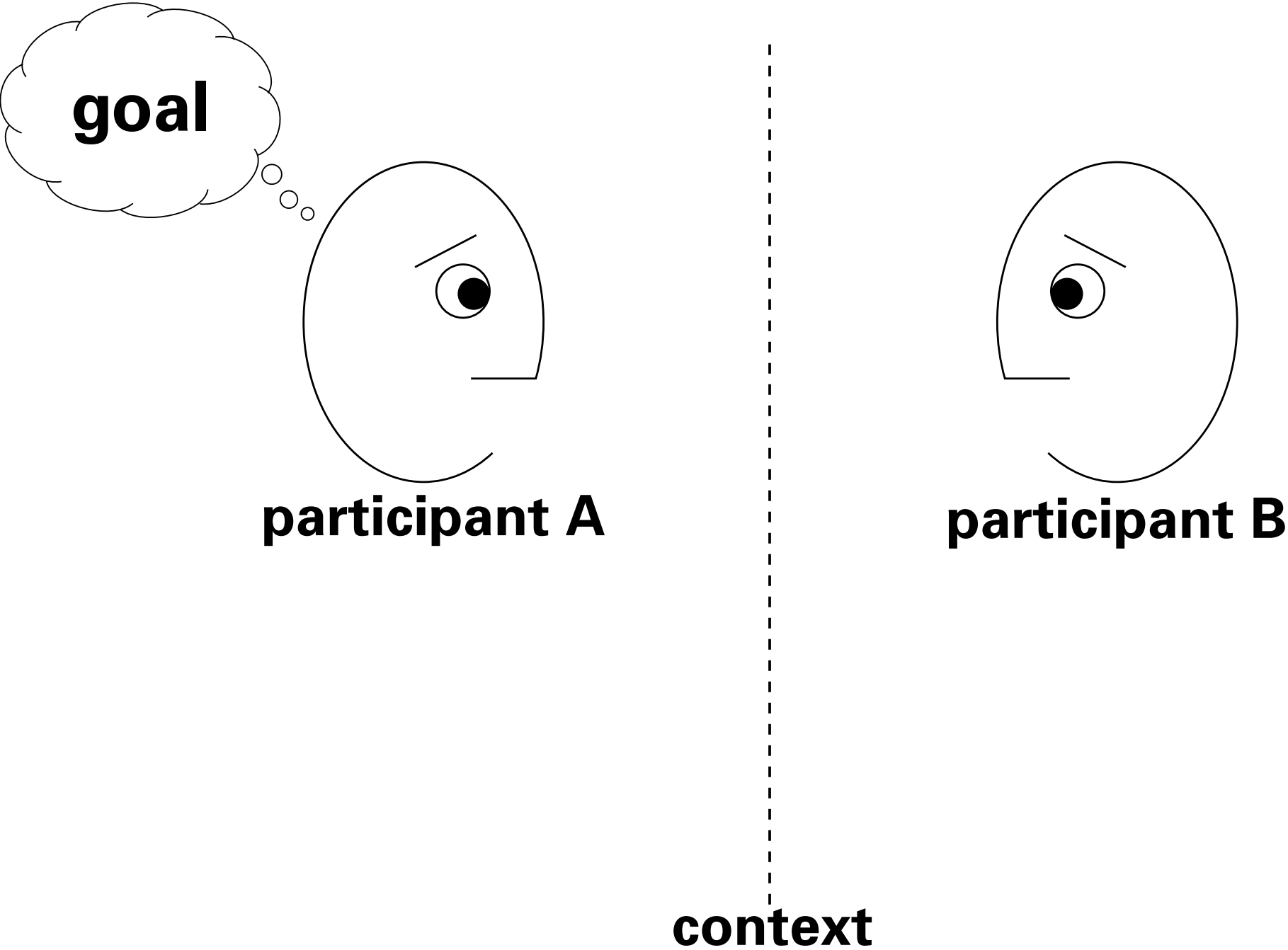


After Dubberly Design & Paul Pangaro

A participant has a goal.

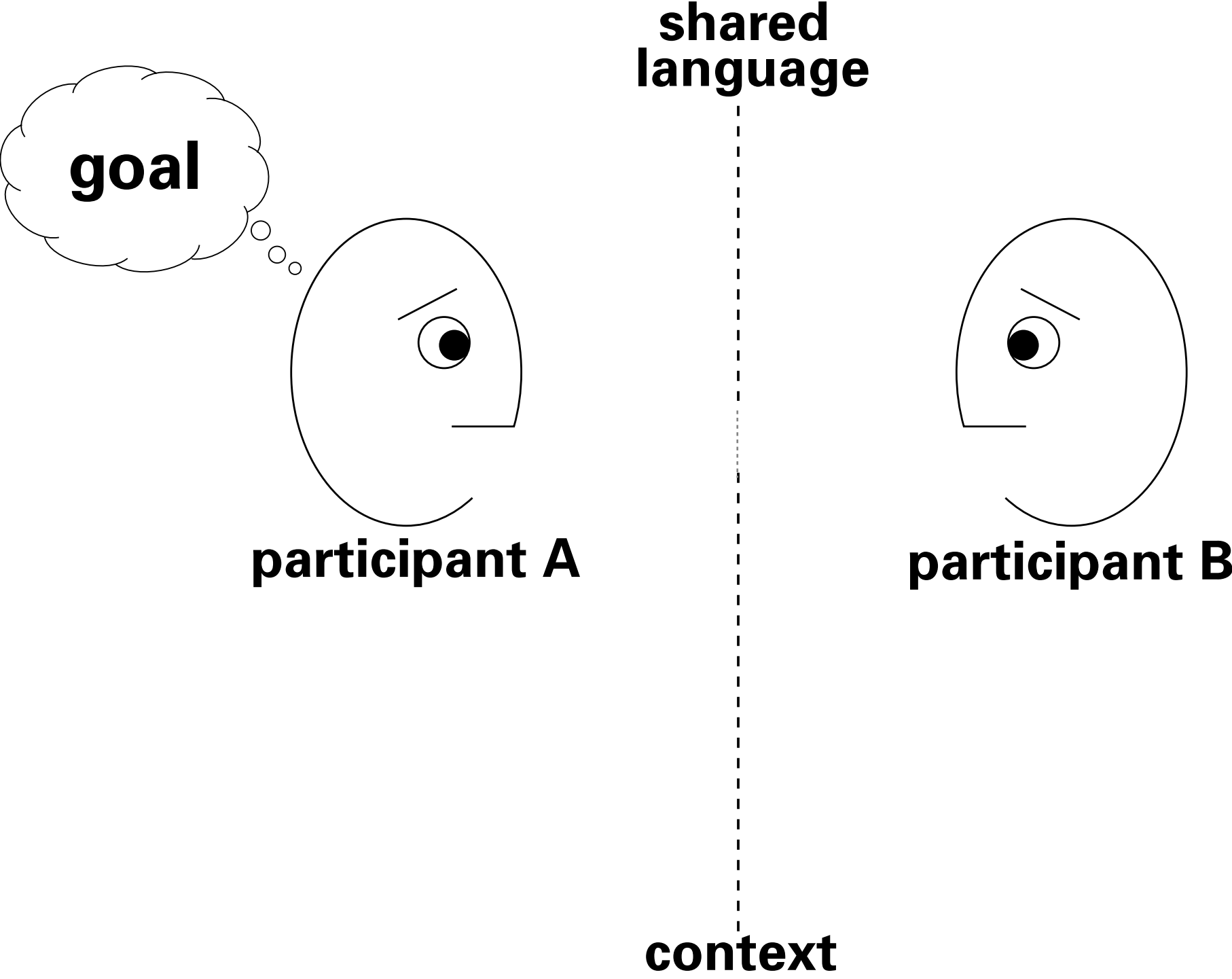


Chooses a context.



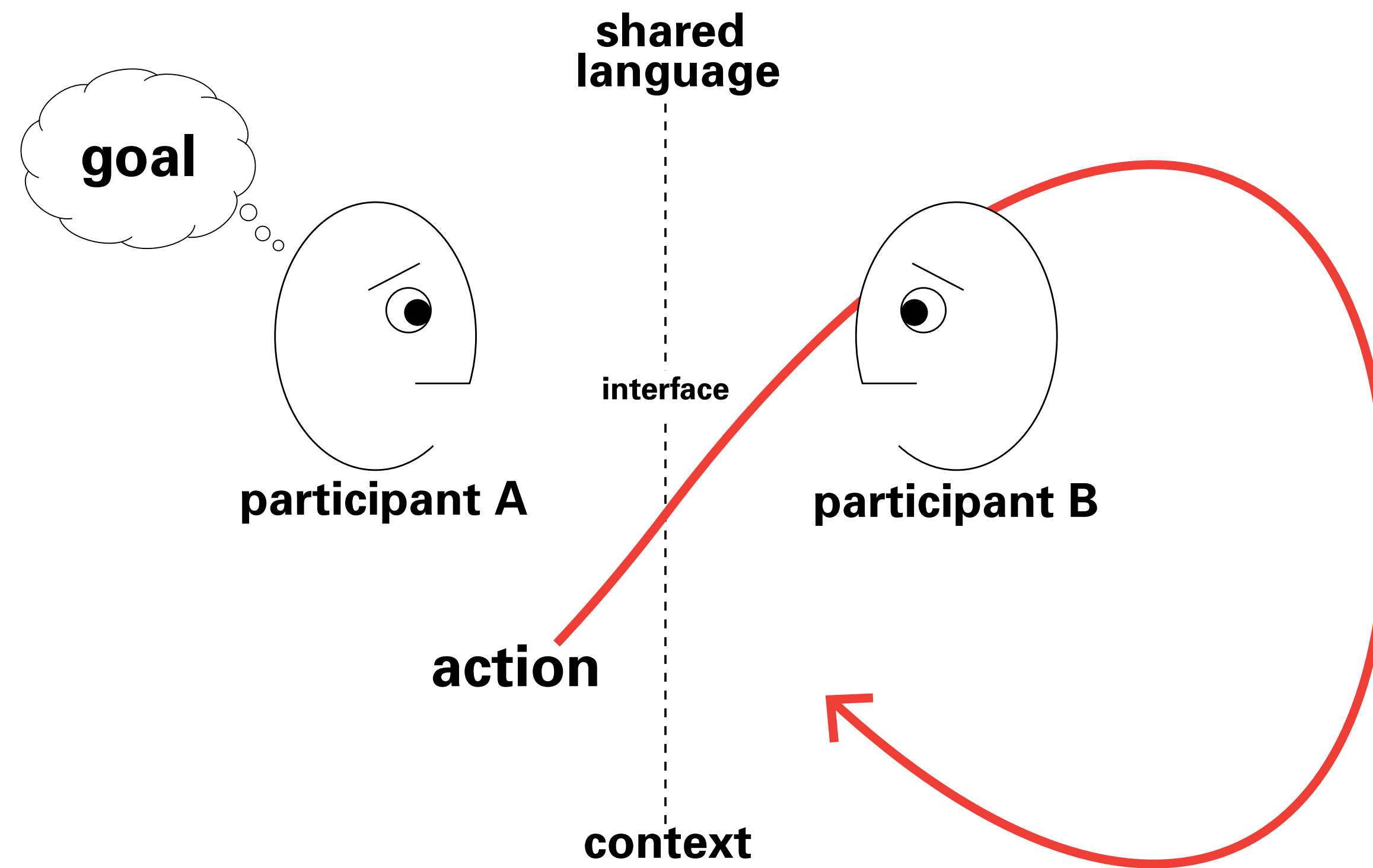
After Dubberly Design & Paul Pangaro

Chooses a language.



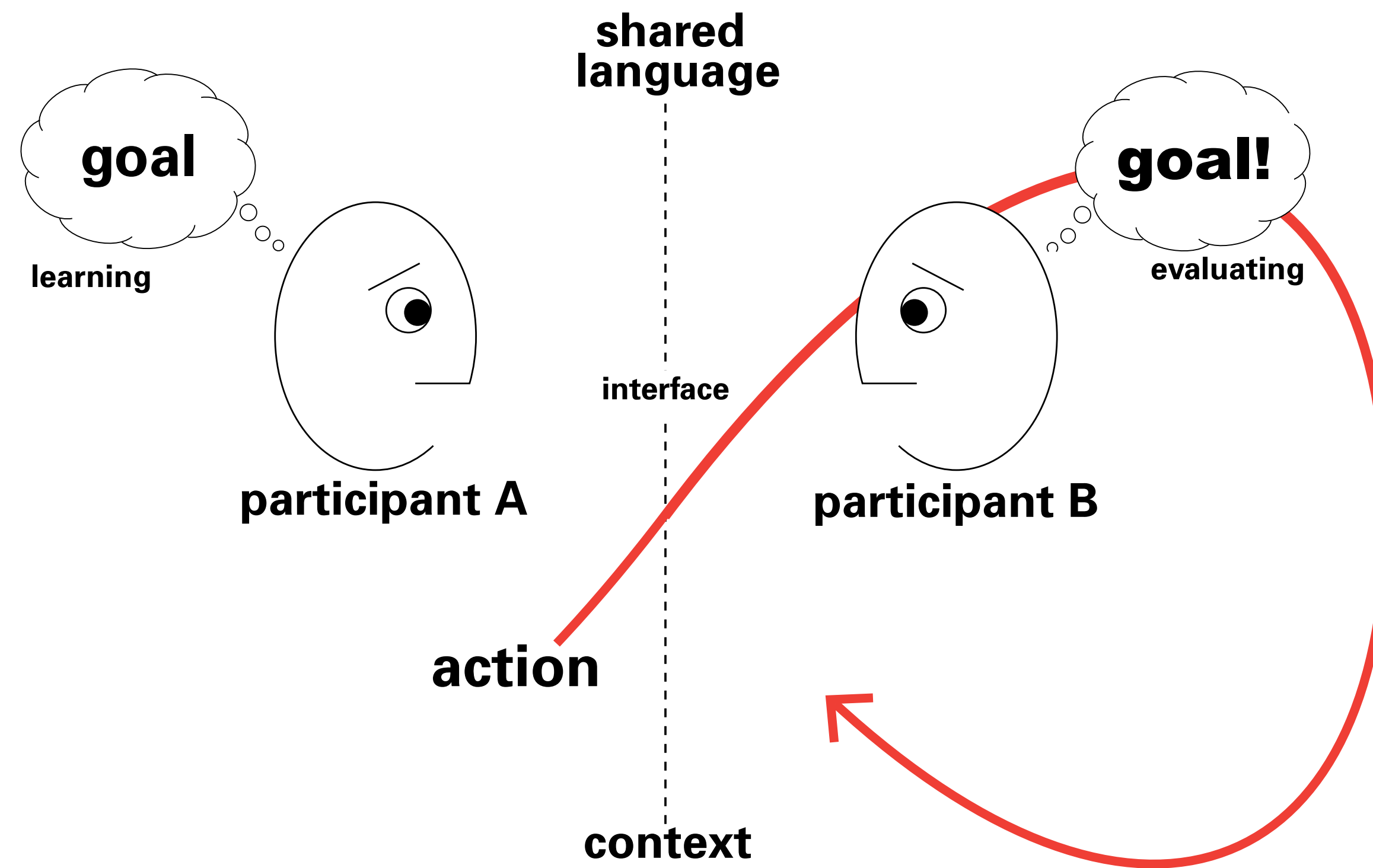
After Dubberly Design & Paul Pangaro

Begins an exchange.



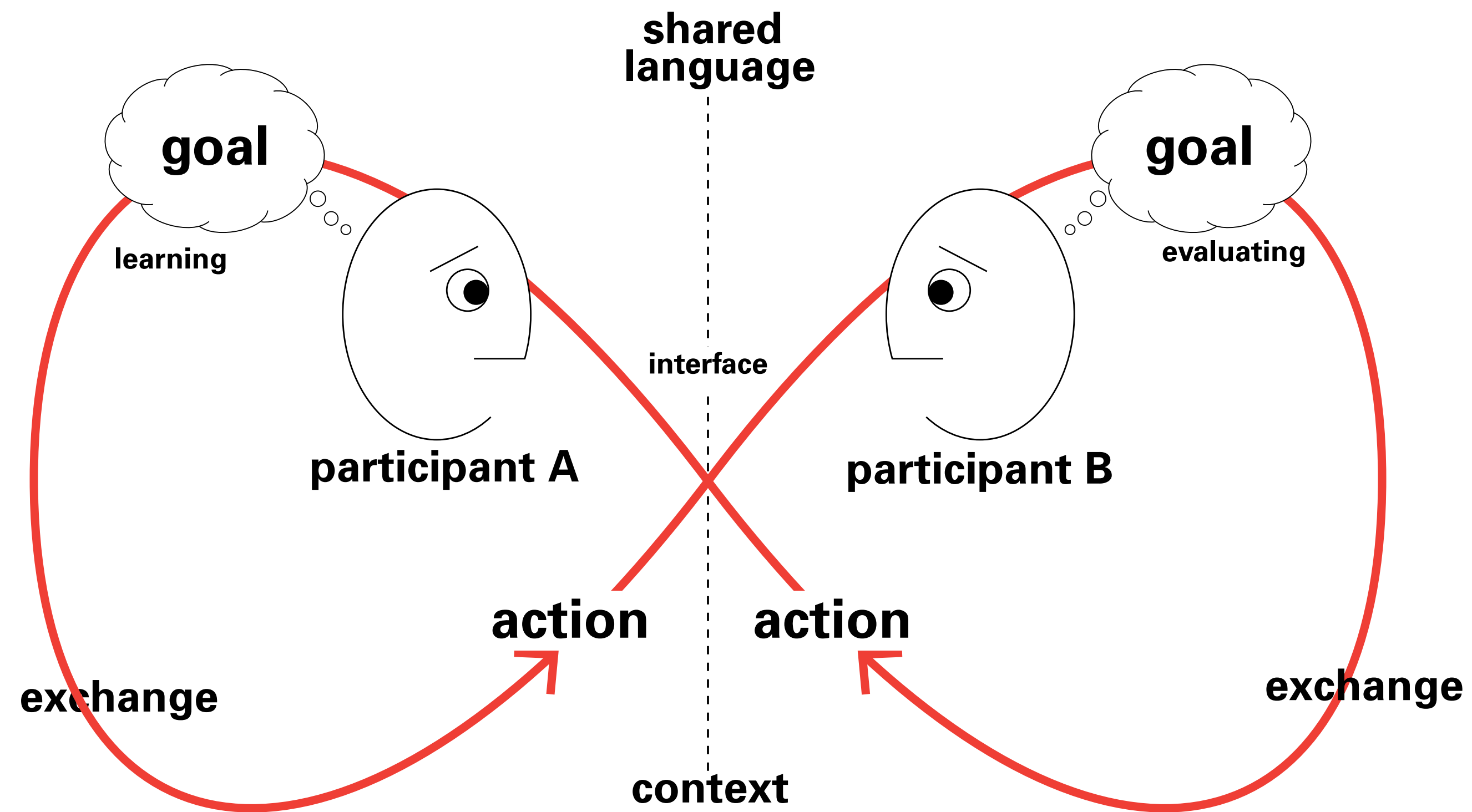
After Dubberly Design & Paul Pangaro

May evoke a response...



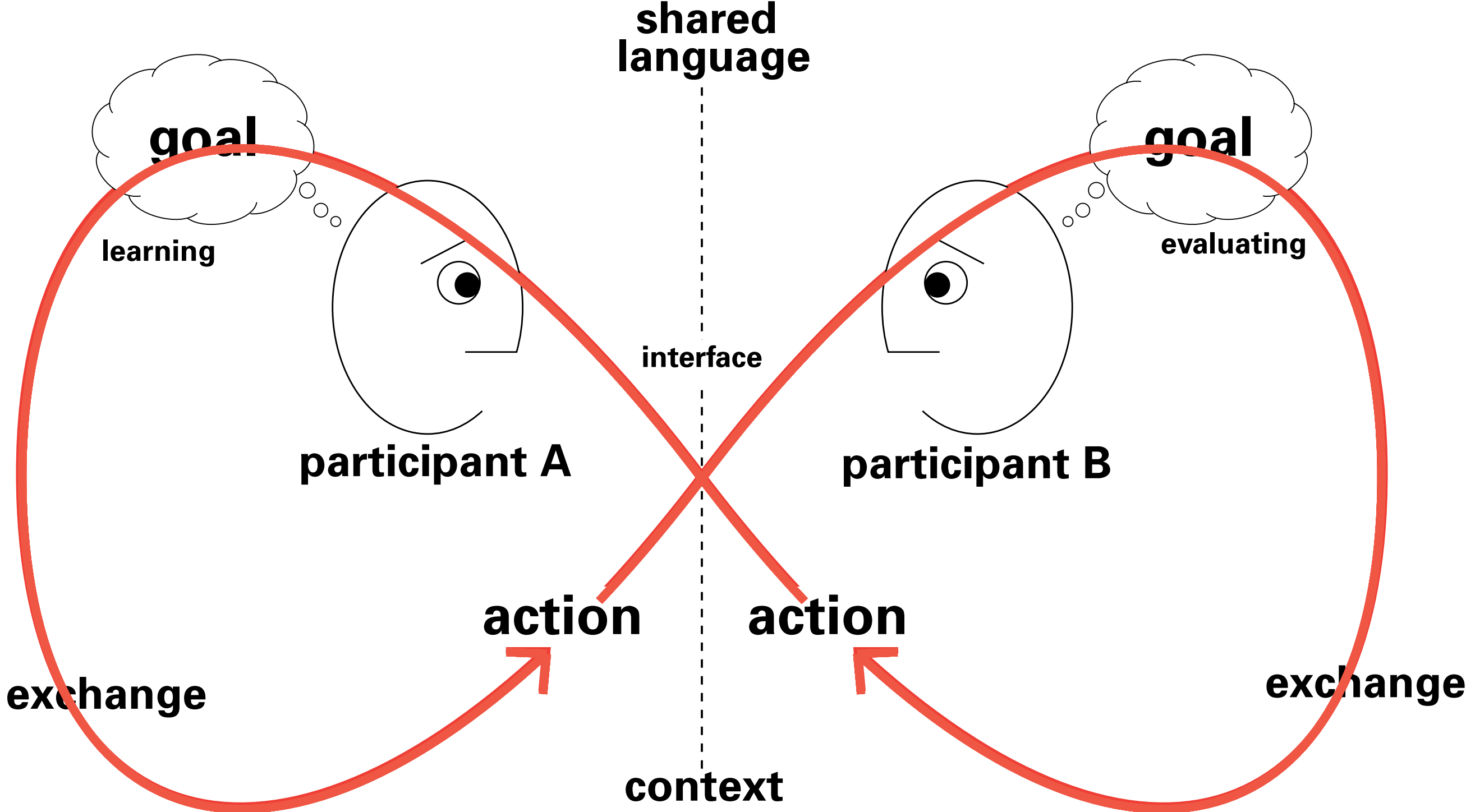
After Dubberly Design & Paul Pangaro

... and a reaction that evokes a reaction...



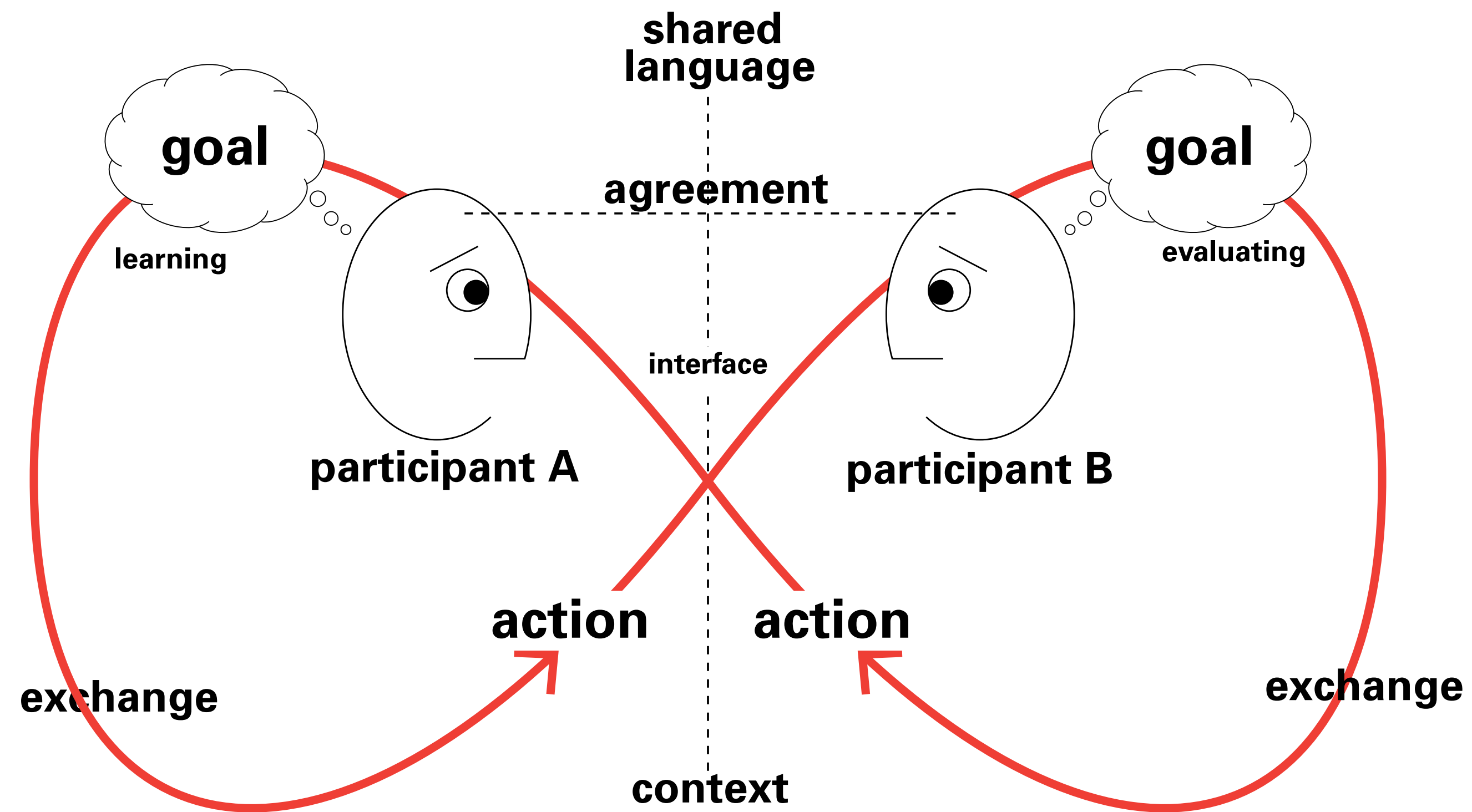
After Dubberly Design & Paul Pangaro

The engagement may continue.



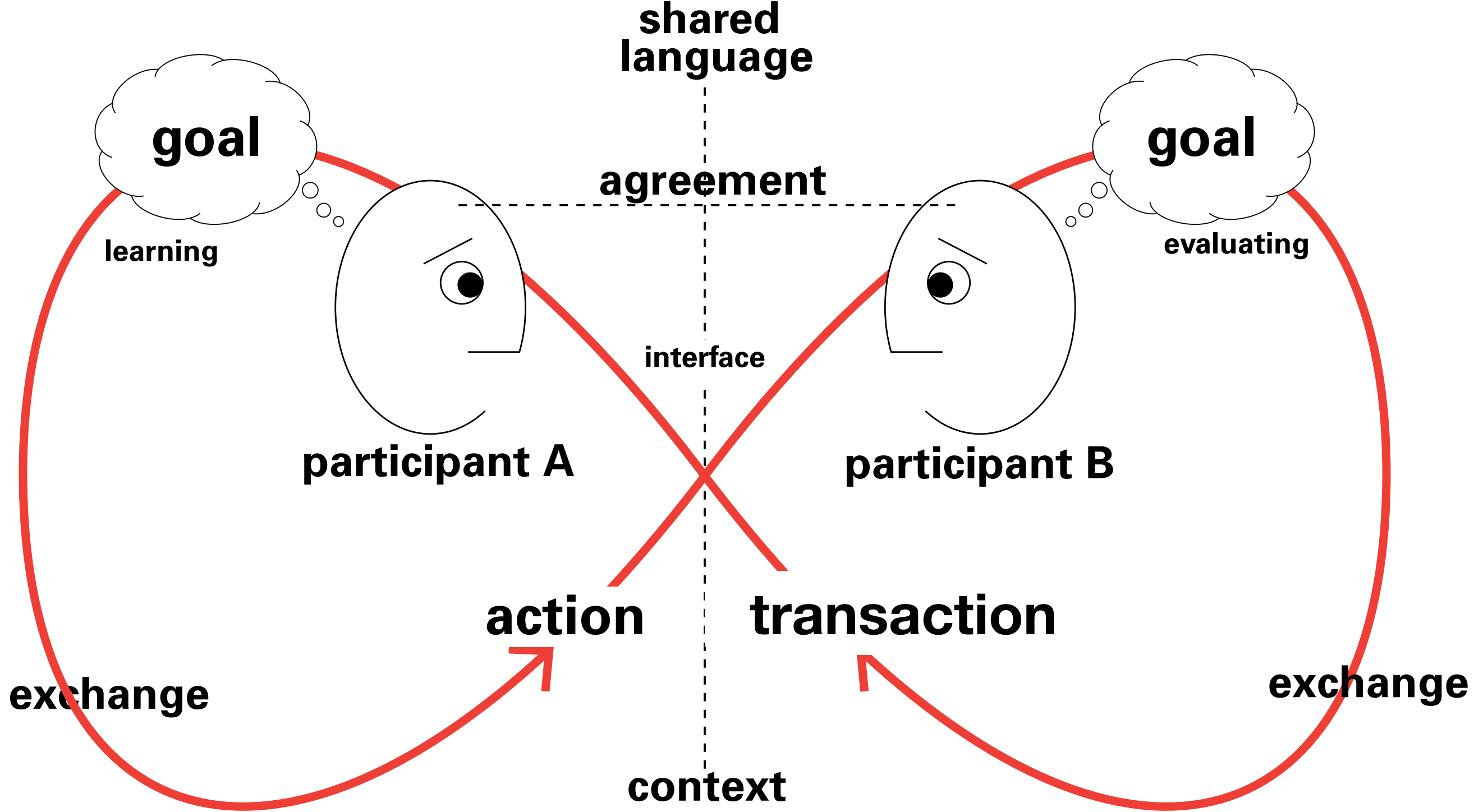
After Dubberly Design & Paul Pangaro

An agreement may be reached.



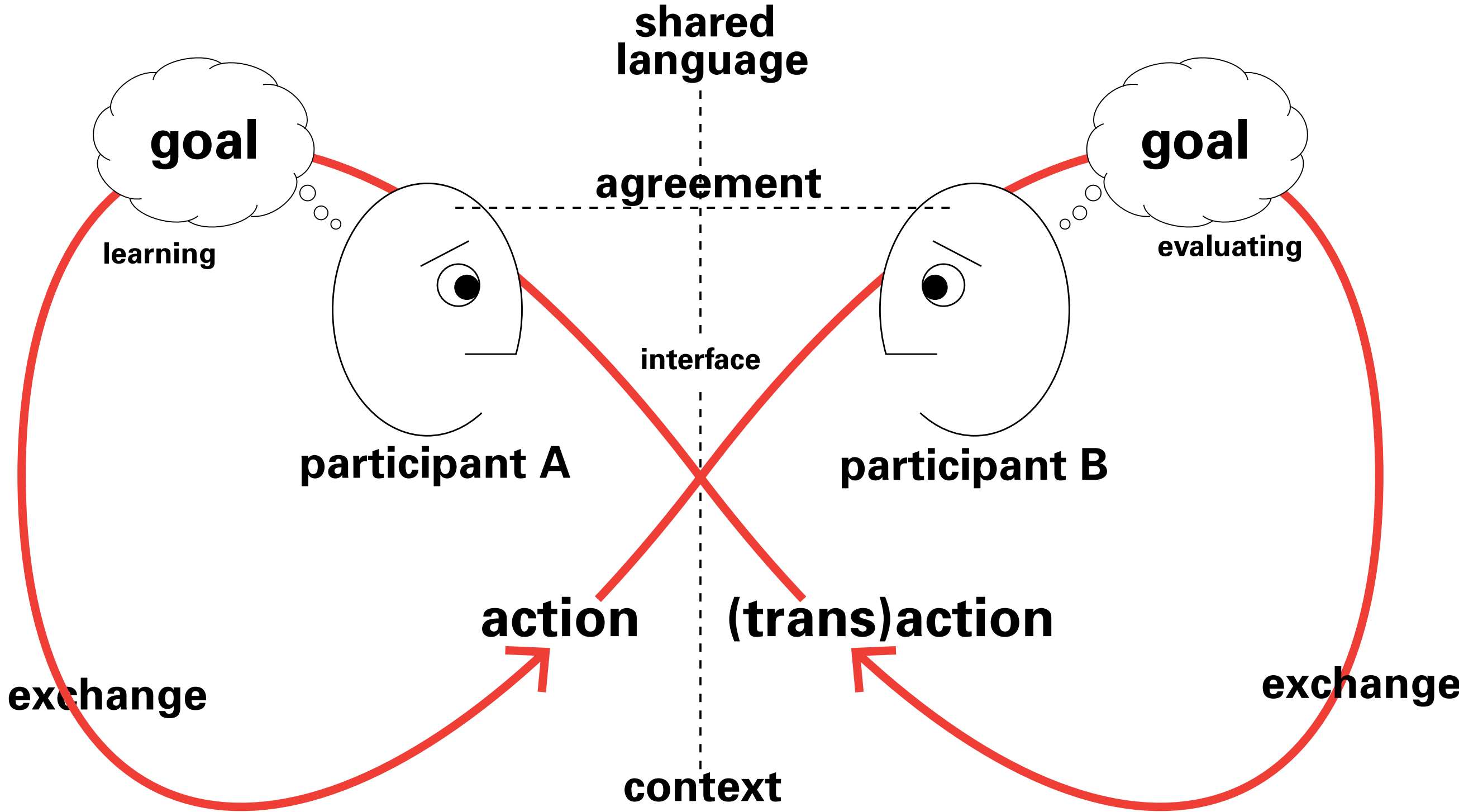
After Dubberly Design & Paul Pangaro

A transaction may occur.



After Dubberly Design & Paul Pangaro

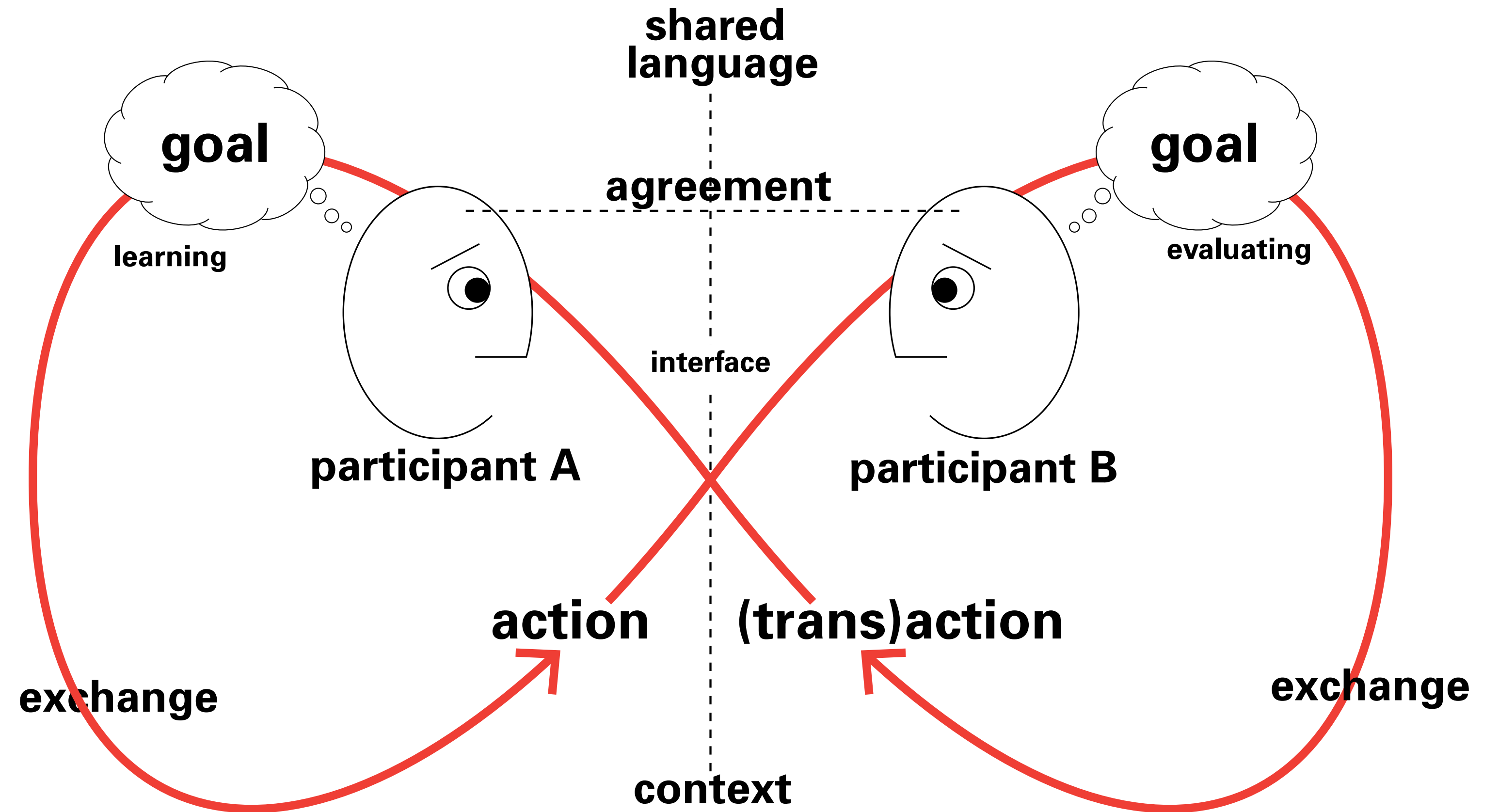
Conversation Model



See also Pangaro: Economy of Insight

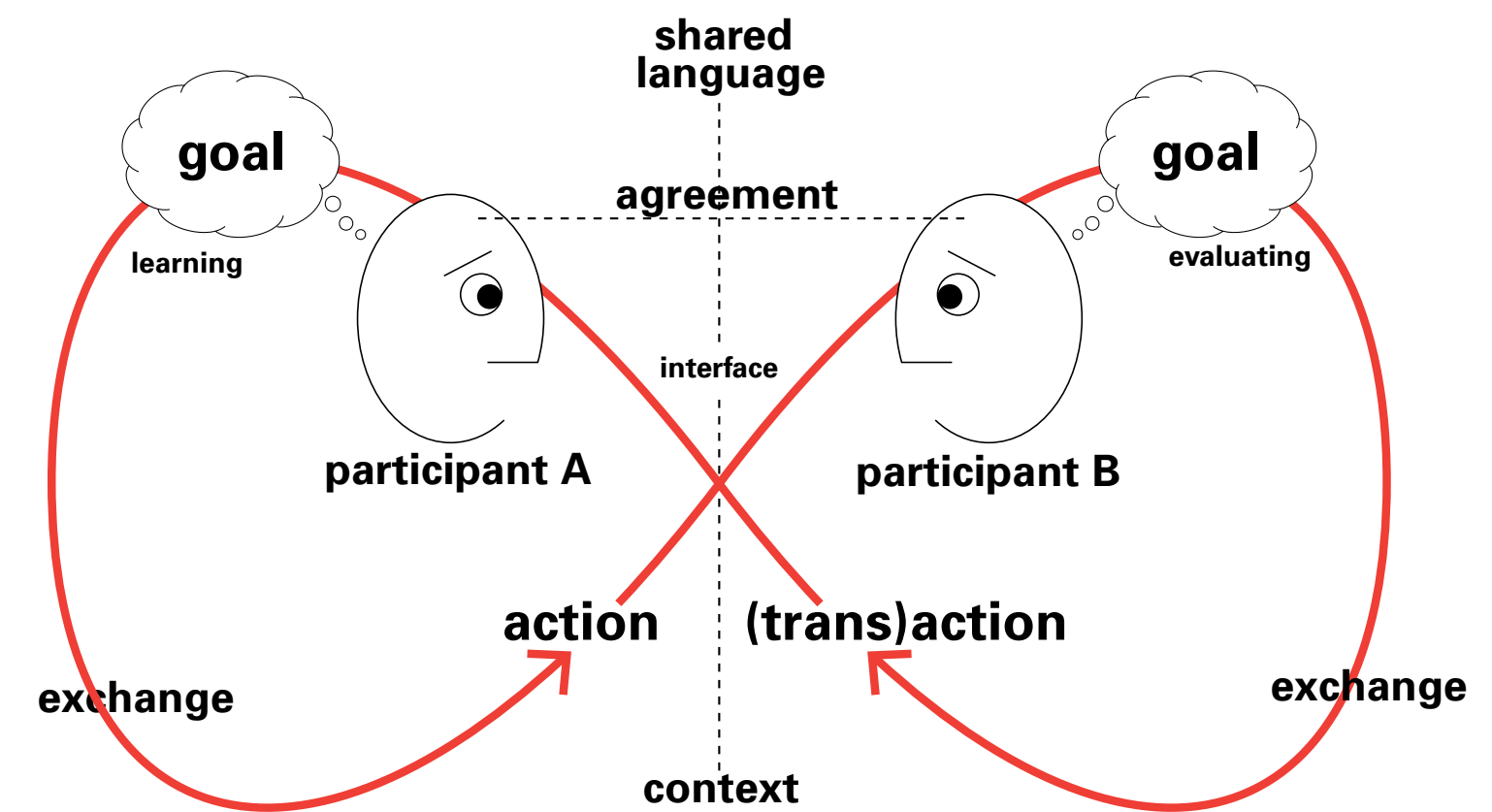
Conversation Model — C-L-E-A-T

C – Context
L – Language
E – Engagement
A – Agreement
T – Transaction



Conversation Model

Why does conversation matter?



- *to act together, we must reach agreement*
- *to reach agreement, we must have an exchange*
- *to hold an exchange, we must have shared language.*

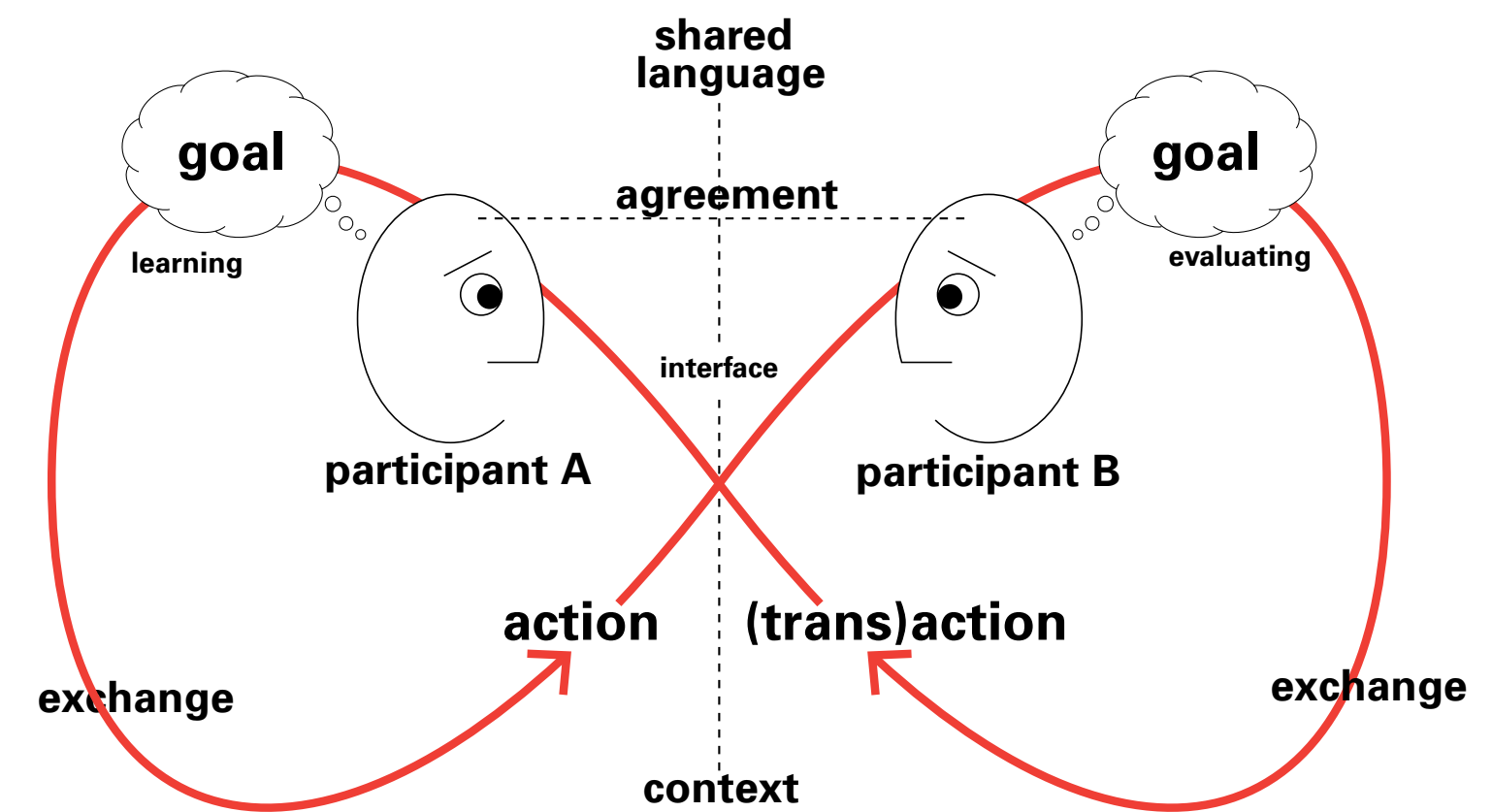
To cooperate and collaborate requires conversation.

Conversation Model

What may follow from conversation?

- *shared history*
- *relationship*
- *trust*
- *respect*
- *unity.*

All these require conversation.

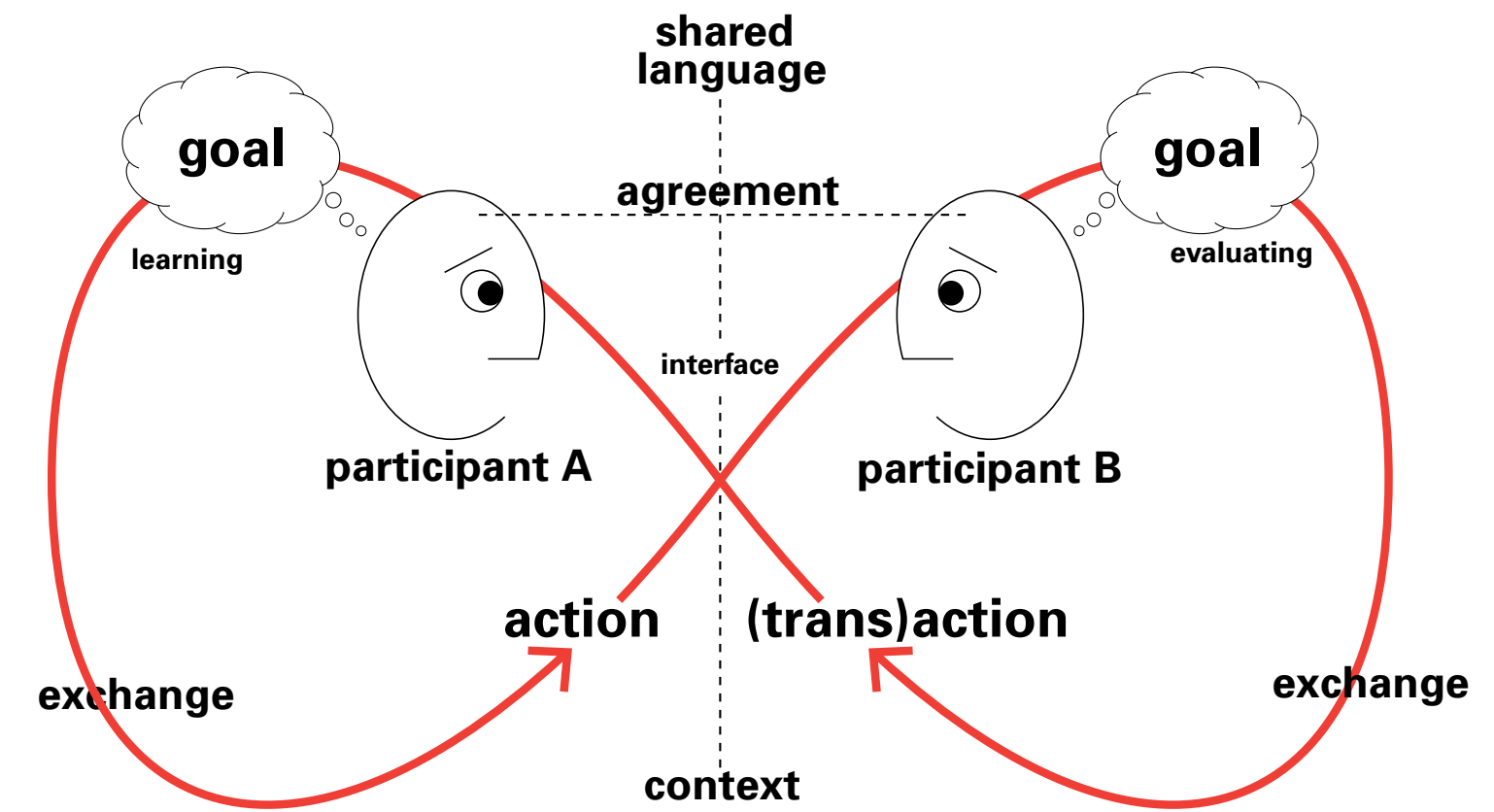


Conversation Model

What does conversation enable?

- *community*
- *commerce*
- *culture*
- *government*
- *society.*

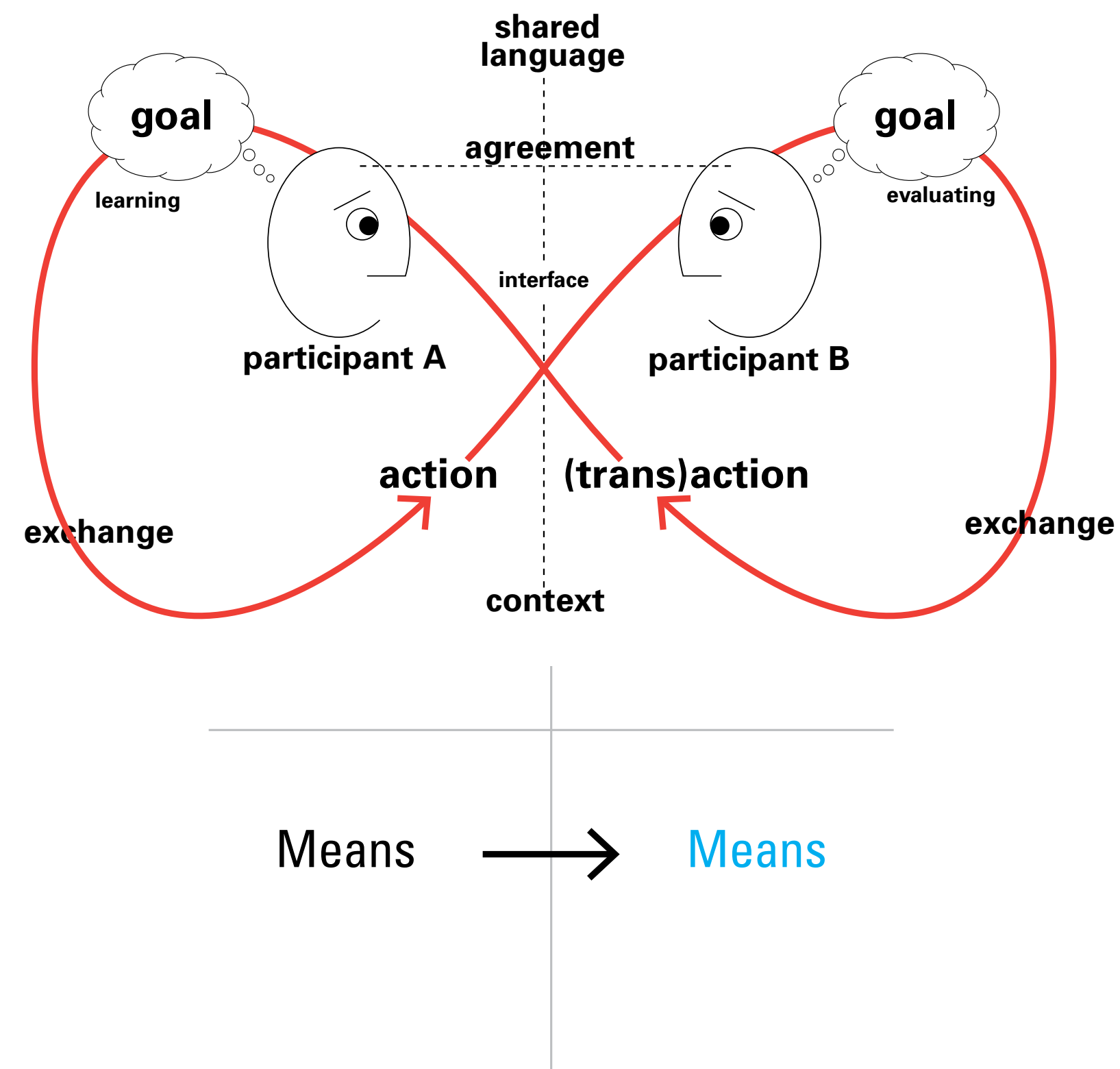
All these **demand** conversation.



Architecture of Conversation

A and B may talk about goals, means, or both

“What is the goal? And how

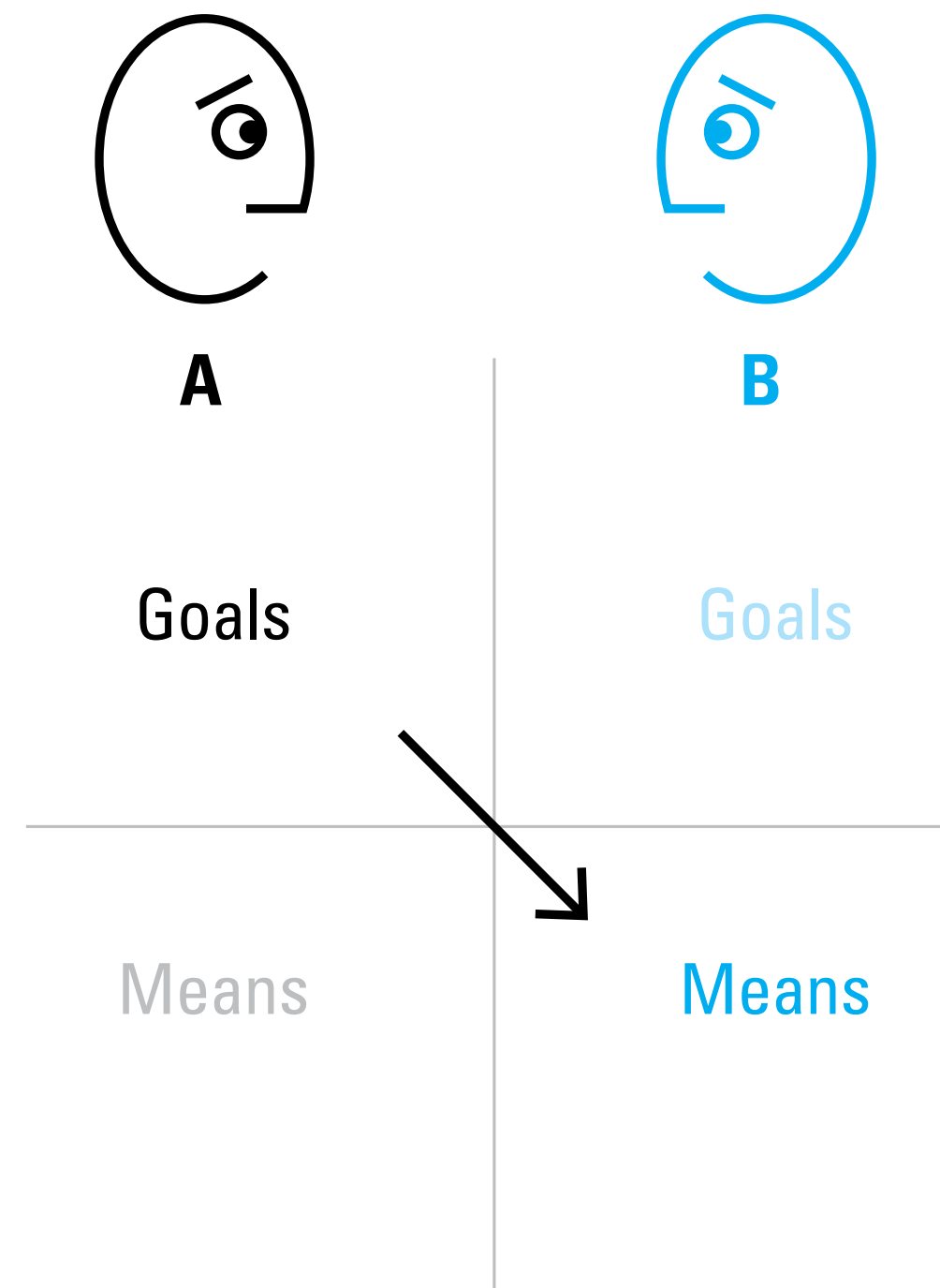


— adopted from Hugh Dubberly
after Paul Pangaro and Gordon Pask

Controlling

A tells B what to do and how to do it

“Alexa, give me some news from NPR.” —does this one

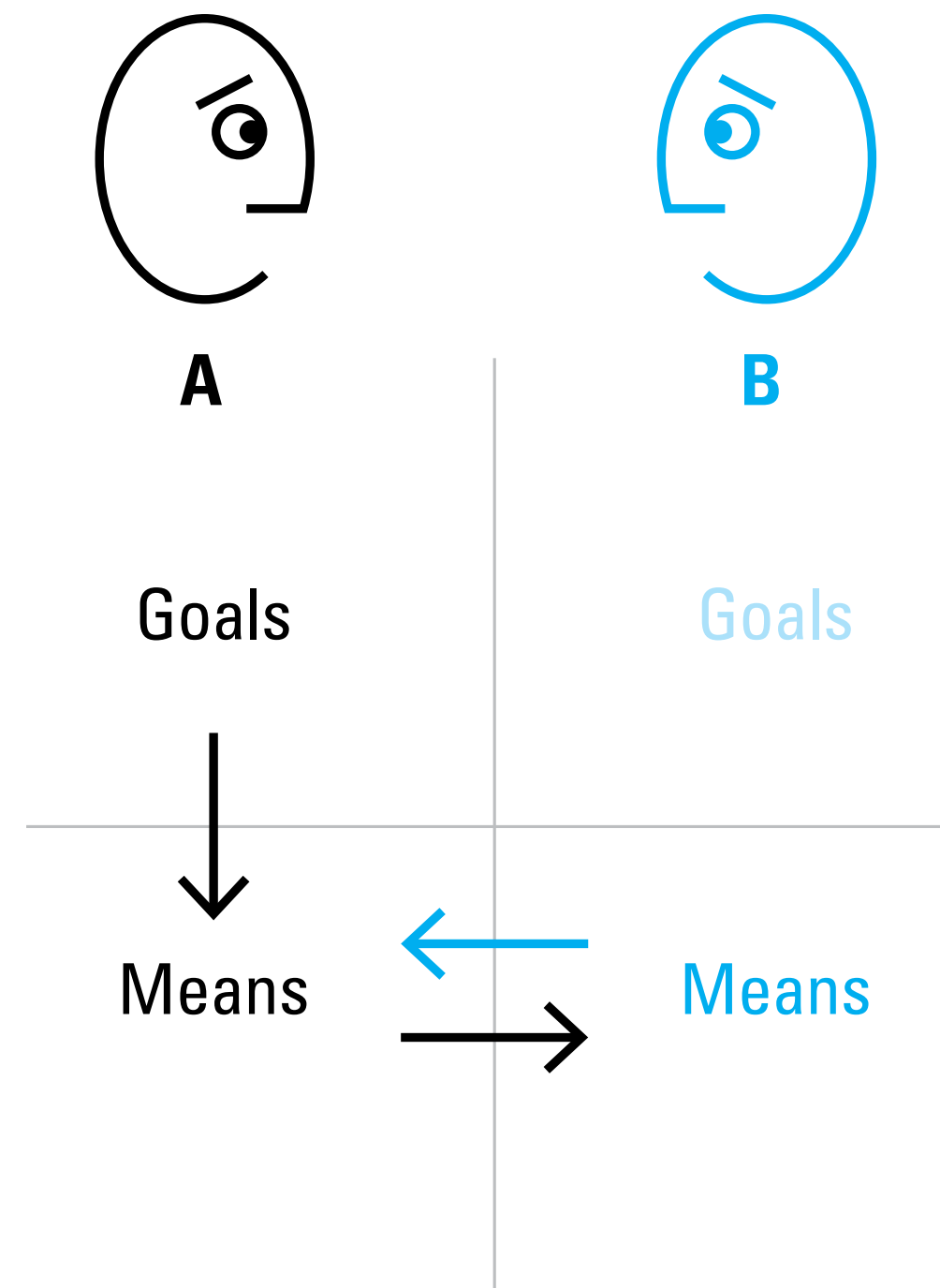


— adopted from Hugh Dubberly
after Paul Pangaro and Gordon Pask

Guiding

A sets goal but discusses means with B

“Alexa, I want to listen to news, what are my options?”

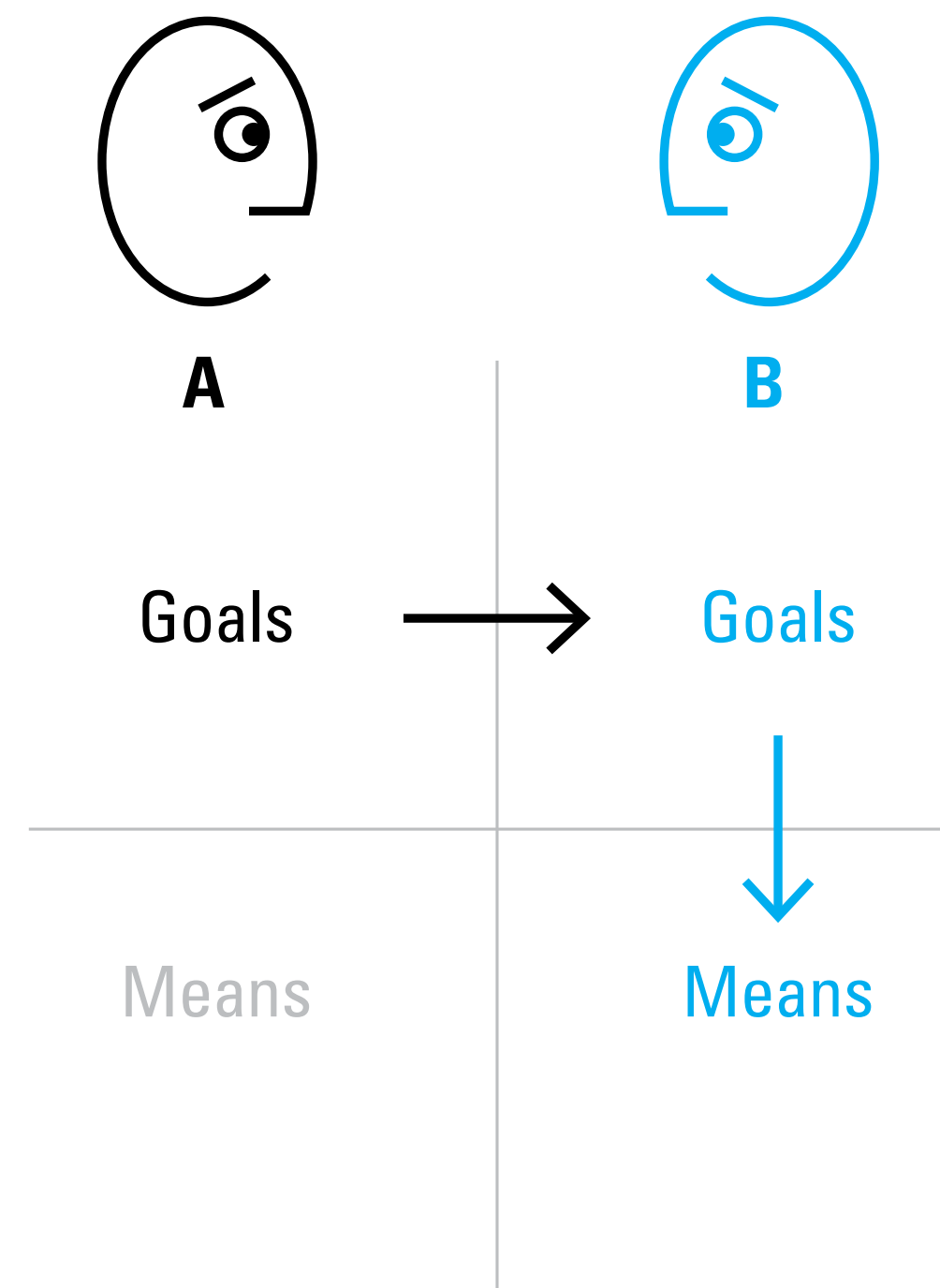


— adopted from Hugh Dubberly
after Paul Pangaro and Gordon Pask

Delegating

A sets the goal but lets B decide the means to reach it

“Alexa, some news please.” —does this one

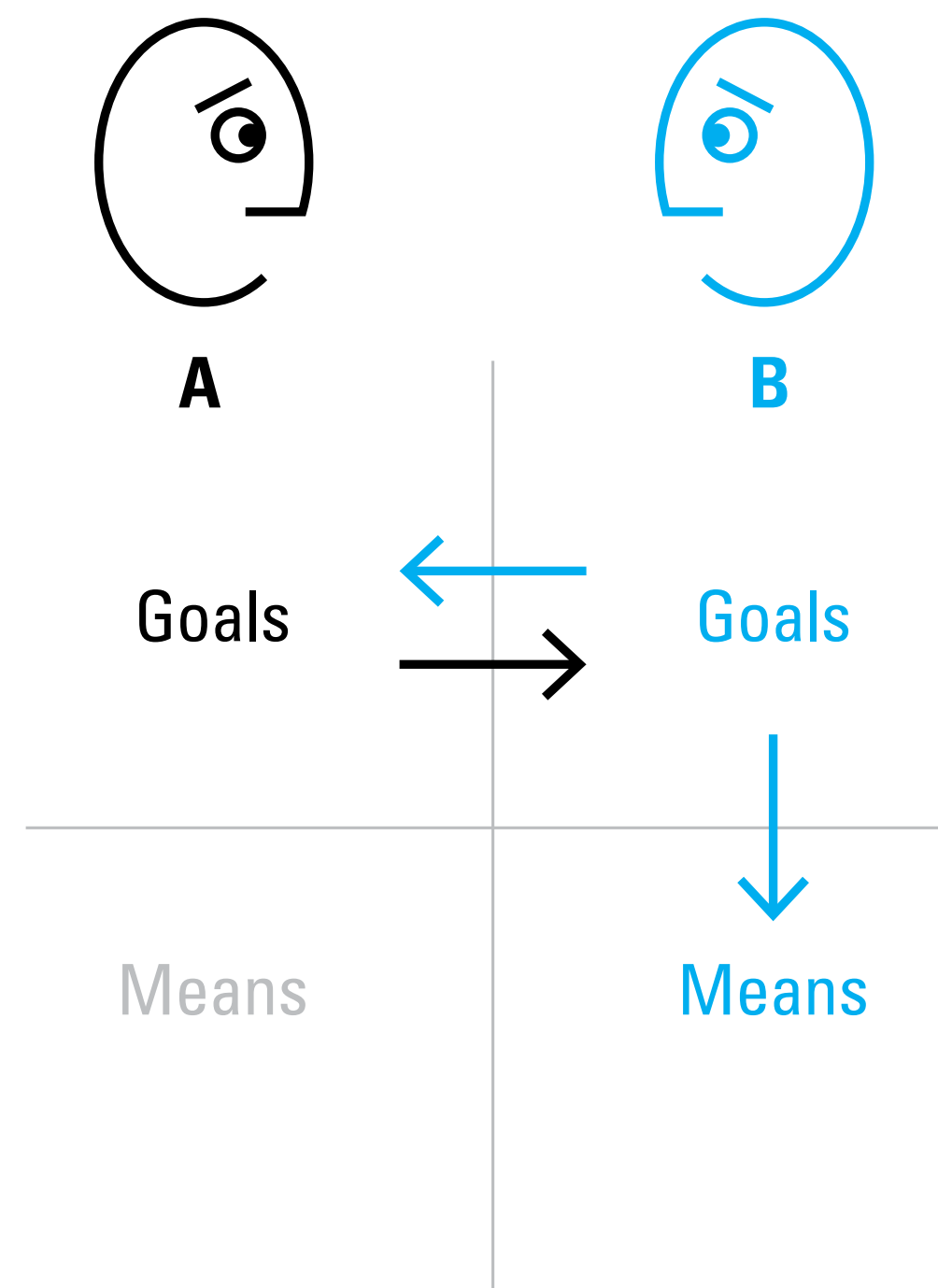


— adopted from Hugh Dubberly
after Paul Pangaro and Gordon Pask

Collaborating

A and B decide together on goals

“Alexa, how about I listen to something?”



— adopted from Hugh Dubberly
after Paul Pangaro and Gordon Pask

Conversational Interfaces

Alexa, define a “*good conversation*”?

- *stays sensitive to your context & language*
- *engages you — keeps continuity in the exchange*
- *leads to agreements — even agreements-to-disagree*
- *enables coordination — acting together with others.*

Alexa, why can't AI + today's “Conversation Interfaces” do these things?

Conversational Interfaces

Cortana, define a “*great conversation*”?

- *tells you things you enjoy learning – delights you*
- *is surprising – energizes you*
- *goes places you didn't expect to go – is generative*
- *evolves in ways you couldn't evolve on your own.*

Cortana, why can't AI + today's “Conversation Interfaces” do these things?

Conversational Interfaces

Siri, what makes a “*great conversational partner*”?

- *asks great questions*
- *offers different ways to achieve your goal*
- *collaborates with you to define new goals*
- *helps you to be what you want to be... or **to become.***

Siri, will Conversational Interfaces become great conversational partners?

The Design of Ethical Interfaces

Design & Prototyping – Research Questions

#1. Question Engine – Do users evolve better understanding?

#2. Universal Dialog UI – Do users increase their agency?

#3. Turning Test – Do users learn from the conversation?

Ethical Intentions — Conversational Interfaces

Intention #1 — Build cooperative interfaces

Conversation is a **cooperative interface** when sequences of coherent interactions enable participants to evolve their points-of-view such that understanding and agreement are ongoing.

Intentions of Interactions for Conversation v3 — April 2019

Ethical Intentions — Conversational Interfaces

Intention #2 — Build ethical interfaces

Conversation is an **ethical interface** when there is reliable transparency of action + intent (what + why), such that trust may build and be maintained over time.

There are many different ways you can use our services – to search for and share information, to communicate with other people or to create new content. When you share information with us, for example by creating a [Google Account](#), we can make those services even better – to show you more relevant search results and ads, to help you connect with people or to make sharing with others quicker and easier. As you use our services, we want you to be clear how we're using information and the ways in which you can protect your privacy.

Our Privacy Policy explains:

- What information we collect and why we collect it.
- How we use that information.
- The choices we offer, including how to access and update information.

We've tried to keep it as simple as possible, but if you're not familiar with terms like cookies, IP addresses, pixel tags and browsers, then read about these [key terms](#) first. Your privacy matters to Google so whether you are new to Google or a long-time user, please do take the time to get to know our practices – and if you have any questions [contact us](#).

Information we collect

[Back to top](#)

We collect information to provide better services to all of our users – from figuring out basic stuff like which language you speak, to more complex things like which ads you'll find most useful, the people who matter most to you online, or which YouTube videos you might like.

We collect information in the following ways:

- **Information you give us.** For example, many of our services require you to sign up for a Google Account. When you do, we'll ask for [personal information](#), like your name, email address, telephone number or [credit card](#) to store with your account. If you want to take full advantage of the sharing features we offer, we might also ask you to create a publicly visible [Google Profile](#), which may include your name and photo.
- **Information we get from your use of our services.** We collect information about the services that you use and how you use them, like when you watch a video on YouTube or visit a website that uses our advertising services, or view and interact with our ads and content. This information includes:

- **Device information**

We collect [device-specific information](#) (such as your hardware model, operating system version, [unique device identifiers](#), and mobile network information including phone number). Google may associate your [device identifiers](#) or [phone number](#) with your Google Account.

- **Log information**

When you use our services or view content provided by Google, we automatically collect and store certain information in [server logs](#). This includes:

- details of how you used our service, such as your search queries.
- telephony log information like your phone number, calling-party number, forwarding numbers, time and date of calls, duration of calls, SMS routing information and types of calls.

- **Internet protocol address.**

- device event information such as crashes, system activity, hardware settings, browser type, browser language, the date and time of your request and referral URL.
- cookies that may uniquely identify your browser or your Google Account.

- **Location information**

When you use Google services, we may collect and process information about your [actual location](#). We use various technologies to determine location, including IP address, GPS, and other sensors that may, for example, provide Google with information on nearby devices, Wi-Fi access points and cell towers.

- **Unique application numbers**

Certain services include a unique application number. This number and information about your installation (for example, the operating system type and application version number) may be sent to Google when you install or uninstall that service or when that service periodically contacts our servers, such as for automatic updates.

- **Local storage**

We may collect and store information (including personal information) locally on your device using mechanisms such as [browser web storage](#) (including HTML 5) and [application data caches](#).

- **Cookies and similar technologies**

We and our partners use various technologies to collect and store information when you visit a Google service, and this may include using [cookies or similar technologies](#) to identify your browser or device. We also use these technologies to collect and store information when you interact with services we offer to our partners, such as [advertising services](#) or Google features that may appear on other sites. Our Google Analytics product helps businesses and site owners analyze the traffic to their websites and apps. When used in conjunction with our advertising services, such as those using the DoubleClick cookie, Google Analytics information is [linked, by the Google Analytics customer or by Google, using Google technology, with information about visits to multiple sites](#).

Information we collect when you are signed in to Google, in addition to information we

- [Unhook](#) whether your profile name and profile photo appear in shared endorsements that appear in ads.

You may also set your browser to block all cookies, including cookies associated with our services, or to indicate when a cookie is being set by us. However, it's important to remember that many of our services may not function properly if your cookies are disabled. For example, we may not remember your language preferences.

Information you share

[Back to top](#)

Many of our services let you share information with others. Remember that when you share information publicly, it may be indexable by search engines, including Google. Our services provide you with different options on [sharing and removing your content](#).

Accessing and updating your personal information

[Back to top](#)

Whenever you use our services, we aim to provide you with [access to your personal information](#). If that information is wrong, we strive to give you ways to update it quickly or to delete it – unless we have to keep that information for legitimate business or legal purposes.

We aim to maintain our services in a manner that protects information from accidental or malicious destruction. Because of this, after you delete information from our services, we may not immediately delete residual copies from our active servers and may not remove information from our backup systems.

Information we share

[Back to top](#)

We do not share personal information with companies, organizations and individuals outside of Google unless one of the following circumstances applies:

- **With our partners.** We will share personal information with companies, organizations or individuals outside of Google when we have a good-faith belief that access, use, preservation or disclosure of the information is necessary for the sharing of any [sensitive personal information](#).

- **With domain administrators**

If your Google Account is managed for you by a [domain administrator](#) (for example, for G Suite users) then your domain administrator and resellers who provide user support to your organization will have access to your Google Account information (including your email and other data). Your domain administrator may be able to:

- view statistics regarding your account, like statistics regarding applications you install.
- change your account password.
- suspend or terminate your account access.
- access or retain information stored as part of your account.
- receive your account information in order to satisfy applicable law, regulation, legal process or enforceable governmental request.
- restrict your ability to delete or edit information or privacy settings.

Please refer to your domain administrator's policies for more information.

- **For external processing**

We provide personal information to our [affiliates](#) or other trusted businesses or persons to process it for us, based on our instructions and in compliance with our

If other users already have your email, or other information that identifies you, we may show them your publicly visible Google Profile information, such as your name and photo.

If you have a Google Account, we may display your Profile name, Profile photo, and actions you take on Google or on third-party applications connected to your Google Account (such as +1's, reviews you write and comments you post) in our services, including displaying in ads and other commercial contexts. We will respect the choices you make to [limit sharing or visibility settings](#) in your Google Account.

When you contact Google, we keep a record of your communication to help solve any issues you might be facing. We may use your email address to inform you about our services, such as letting you know about upcoming changes or improvements.

We use information collected from cookies and other technologies, like [pixel tags](#), to improve your user experience and the overall quality of our services. One of the products we use to do this on our own services is Google Analytics. For example, by saving your language preferences, we'll be able to have our services appear in the language you prefer. When showing you tailored ads, we will not associate an identifier from cookies or similar technologies with [sensitive categories](#), such as those based on race, religion, sexual orientation or health.

Our automated systems analyze your content (including emails) to provide you personally relevant product features, such as customized search results, tailored advertising, and spam and malware detection.

We may combine personal information from one service with information, including personal information, from other Google services – for example to make it easier to share things with people you know. Depending on [your account settings](#), your activity on other sites and apps may be associated with your personal information in order to improve Google's services and the ads delivered by Google.

We will ask for your consent before using information for a purpose other than those that are set out in this Privacy Policy.

Compliance and cooperation with regulatory authorities

[Back to top](#)

We regularly review our compliance with our Privacy Policy. We also adhere to several [self regulatory frameworks](#), including the EU-US and Swiss-US Privacy Shield Frameworks. When we receive formal written complaints, we will contact the person who made the complaint to follow up. We work with the appropriate regulatory authorities, including local data protection authorities, to resolve any complaints regarding the transfer of personal data that we cannot resolve with our users directly.

Changes

[Back to top](#)

Our Privacy Policy may change from time to time. We will not reduce your rights under this Privacy Policy without your explicit consent. We will post any privacy policy changes on this page and, if the changes are significant, we will provide a more prominent notice (including, for certain services, email notification of privacy policy changes). We will also keep prior versions of this Privacy Policy in an archive for your review.

Specific product practices

[Back to top](#)

The following notices explain specific privacy practices with respect to certain Google products and services that you may use:

- [Chrome and Chrome OS](#)
- [Play Books](#)
- [Payments](#)
- [Fiber](#)
- [Project Fi](#)
- [G Suite for Education](#)
- [YouTube Kids](#)
- [Google Accounts Managed with Family Link](#)

For more information about some of our most popular services, you can visit the [Google Product Privacy Guide](#).

Other useful privacy and security related materials

[Back to top](#)

Further useful privacy and security related materials can be found through Google's [policies and principles pages](#), including:

- Information about our [technologies and principles](#), which includes, among other things, more information on
 - [how Google uses cookies](#).
 - technologies we use for advertising.
 - how we [recognize patterns like faces](#).
- A [page](#) that explains what data is shared with Google when you visit websites that use our advertising, analytics and social products.
- The [Privacy Checkup](#) tool, which makes it easy to review your key privacy settings.
- Google's [safety center](#), which provides information on how to stay safe and secure online.

- **For external processing**

We provide personal information to our [affiliates](#) or other trusted businesses or persons to process it for us, based on our instructions and in compliance with our Privacy Policy and any other appropriate confidentiality and security measures.

- **For legal reasons**

We will share personal information with companies, organizations or individuals outside of Google if we have a good-faith belief that access, use, preservation or disclosure of the information is reasonably necessary to:

- meet any applicable law, regulation, [legal process or enforceable governmental request](#).
- enforce applicable Terms of Service, including investigation of potential violations.
- detect, prevent, or otherwise address fraud, security or technical issues.
- protect against harm to the rights, property or safety of Google, our users or the public as required or permitted by law.

We may share [non-personally identifiable information](#) publicly and with our partners – like publishers, advertisers or connected sites. For example, we may share information publicly to [show trends](#) about the general use of our services.

If Google is involved in a merger, acquisition or asset sale, we will continue to ensure the confidentiality of any personal information and give affected users notice before personal information is transferred or becomes subject to a different privacy policy.

Information security

[Back to top](#)

We work hard to protect Google and our users from unauthorized access to or unauthorized alteration, disclosure or destruction of information we hold. In particular:

- We encrypt many of our services [using SSL](#).
- We offer you [two step verification](#) when you access your Google Account, and a [Safe Browsing feature](#) in Google Chrome.
- We review our information collection, storage and processing practices, including physical security measures, to guard against unauthorized access to systems.
- We restrict access to personal information to Google employees, contractors and

Ethical Intentions — Conversational Interfaces

Intention #3 — Build humane interfaces

Conversation is a **humane interface** when any participant may influence its focus and flow such that collaboration is ongoing.

Intentions of Interactions for Conversation v3 — April 2019

The Design of Ethical Interfaces

Ethical Intentions — Conversational Interfaces

- ***Cooperative*** → *evolving points-of-view* → *agreement*
- ***Ethical*** → *reliable transparency of what + why* → *trust*
- ***Humane*** → *shared focus and flow* → *collaboration*

The Design of Ethical Interfaces

Designers, can we enable conversation for others?

Can we *design for conversation*? Enable interactions that...

- *are cooperative, humane, and ethical*
- *create conditions for great conversations*
- *increase the number of choices open to all*
- *help us to be what we want to be... or become.*

The Design of Ethical Interfaces

Ethical Interfaces — Axiom #1

“As a designer, I shall act always so as to increase the total number of choices for a user.”

— Ethical Imperative, Interaction Designers

The Design of Ethical Interfaces

Ethical Interfaces — Axiom #2

Interaction designers have the responsibility to create conditions such that a user may converse with the interface.

Design for Conversation

Design for Conversation

Ethical Interfaces — Axiom #2

Interaction designers have the responsibility to create conditions such that a user may converse with the interface.

Design **as** Conversation

Ethical Interfaces — Axiom #3 — “Second-order Design”

The goal of second-order design is to facilitate the emergence of conditions in which others can design — to create conditions in which conversations can emerge — and thus to increase the number of choices open to all.

— Dubberly & Pangaro, “Cybernetics and Design: Conversations for Action”, 2019

The Design of Ethical Interfaces

Organizing Principle

“I shall act always so as to increase the total number of choices.”

— Ethical Imperative, Heinz von Foerster

Click for PDF of “Ethics and Second-Order Cybernetics”, 1991

On “Metadesign” – Humberto Maturana

***We are responsible for the language we bring forth,
for the emotions we embody in our language and our actions,
and for the technology they both bring to the world.***

***That is, we are responsible for what we conserve in our
living day-to-day.***

That is an ethical choice at every minute of our lives.

— Hugh Dubberly after H. Maturana

[Click for PDF of "Metadesign" by Humberto Maturana](#)

Thank you.

Special Thanks to:

Brad Myers

Jodi Forlizzi

John Cain

Karen Kornblum Berntsen

Hugh Dubberly

Pooja Upadhyay

Paul Pangaro

pangaro.com/hciiseminar2019/

ppangaro@cmu.edu

Appendices

Design and Cybernetics

Paul Pangaro

pangaro.com/hciiseminar2019/

ppangaro@cmu.edu

The Design of Ethical Interfaces

“If you desire to see, learn how to act.”

— **Aesthetic Imperative**, Heinz von Foerster

Click for PDF of “Ethics and Second-Order Cybernetics”, 1991

We believe cybernetics offers a foundation for 21st-century design practice, with this rationale:

— Dubberly & Pangaro, “Cybernetics and Design: Conversations for Action”, 2019

If design, then systems:

- The prominence of digital technology in daily life cannot be denied (or reversed).
Digital technology comprises systems of systems (Internet of Things).
- Design has expanded from **giving-form** to **creating systems** that support interactions.
Human interactions span thinking and acting, whether mundane or metaphysical.

We must model and tame this complex mesh of mechanisms.

Therefore: systems literacy is a necessary foundation for design.

If design, then systems.

If systems, then cybernetics:

- Digital interactions comprise reliable connections, communication, and feedback.
Human interactions comprise purpose, feedback, and learning.
- The science of communication and feedback, interaction and purpose, is cybernetics.

We must model communication and intention in a common frame.

Therefore: cybernetics is a necessary foundation for design.

If design, then systems.

If systems, then cybernetics.

If cybernetics, then second-order cybernetics:

- Framing “wicked challenges” requires articulating human values and viewpoints. Values and viewpoints are subjective.
- Designers must offer a persuasive rationale for our subjective viewpoints.
- Modeling subjectivity is the province of second-order cybernetics.

We must embrace values and subjectivity at the heart of designing.

Therefore: second-order cybernetics is a necessary foundation for design.

If design, then systems.

If systems, then cybernetics.

If cybernetics, then second-order cybernetics.

If second-order cybernetics, then conversation:

- Taming “wicked challenges” must be grounded in argumentation.
- Argumentation requires conversation so that participants may understand and agree.
- Agreement is necessary for collaboration and effective action.

We must embrace argumentation and collaboration to the heart of 21st-century design.

Therefore: conversation is a necessary foundation for design.

If design, then systems.

If systems, then cybernetics.

If cybernetics, then second-order cybernetics.

If second-order cybernetics, then conversation.

— Dubberly & Pangaro, “Cybernetics and Design: Conversations for Action”, 2019

Appendices

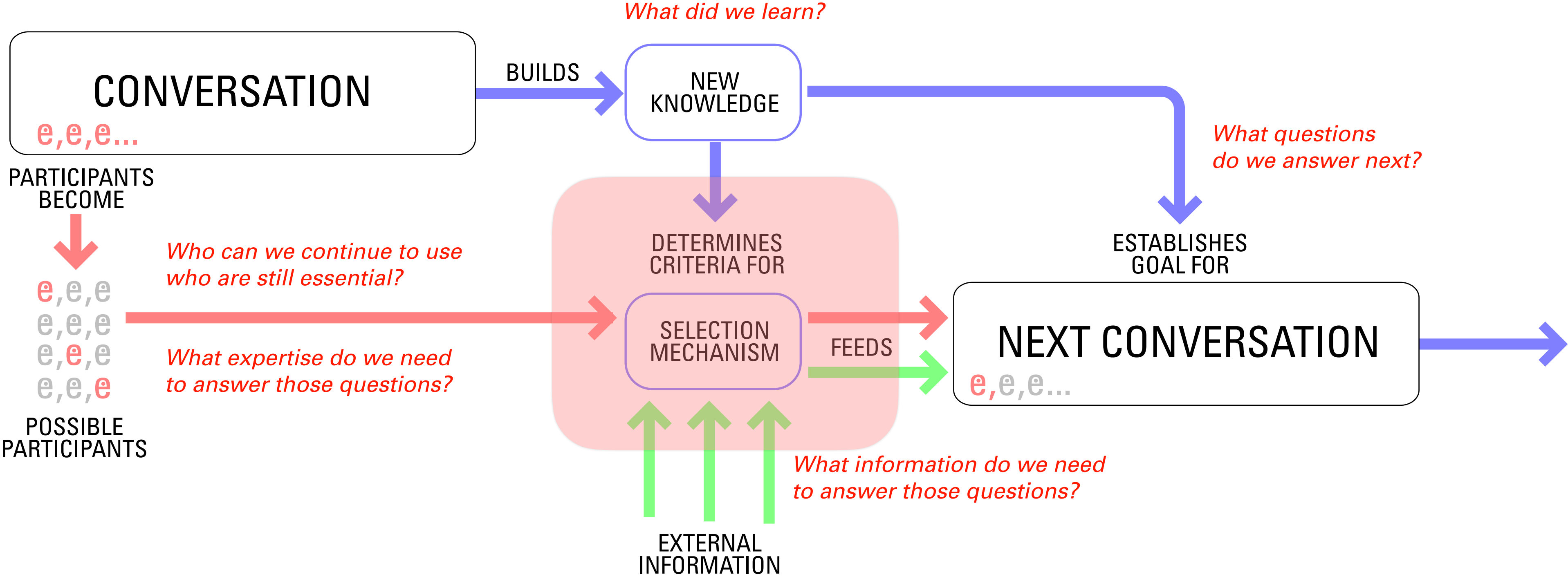
Design as Conversation

Paul Pangaro

pangaro.com/hciiseminar2019/

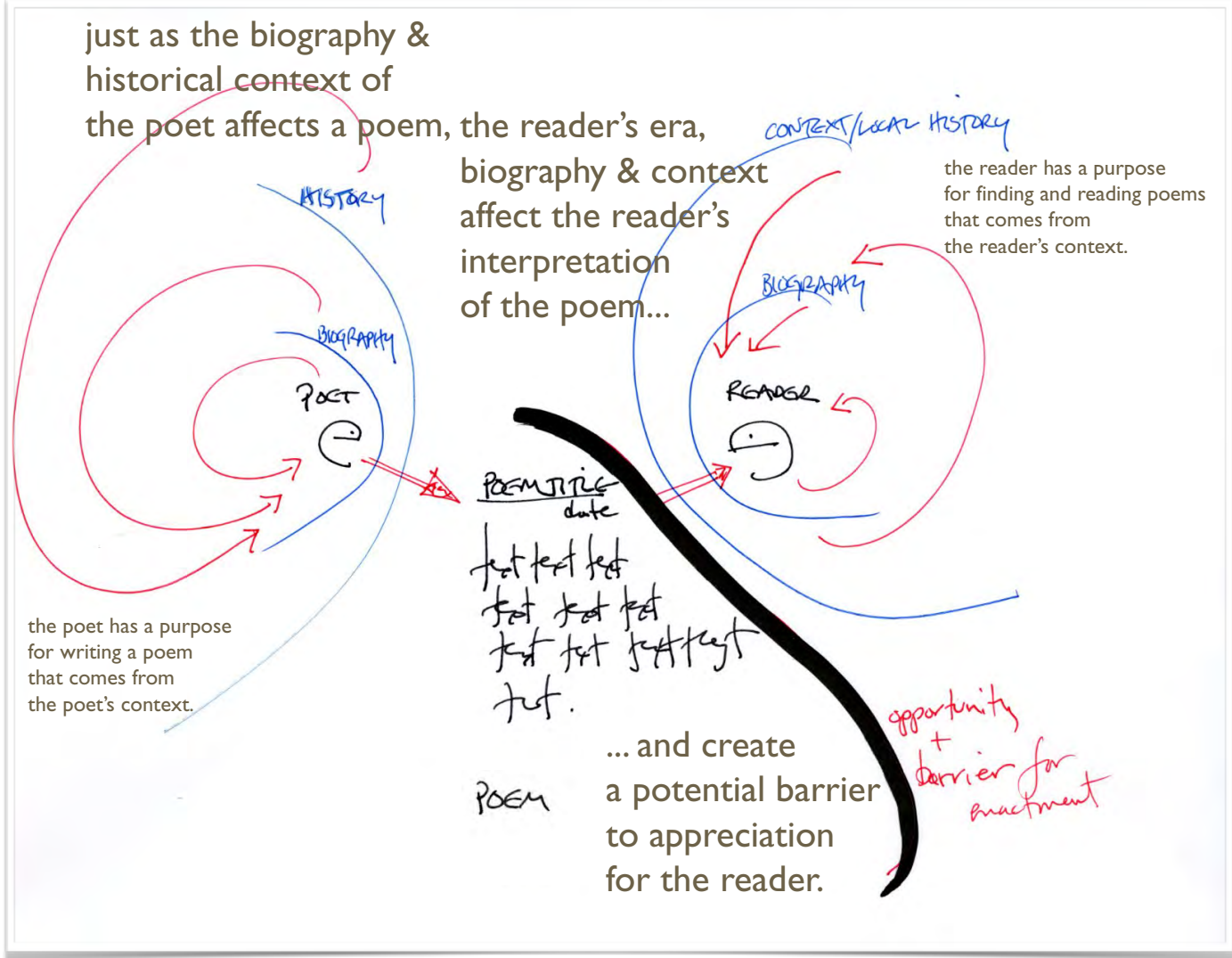
ppangaro@cmu.edu

Designing Engagement / Cadence of Conversations



Paul Pangaro
Modeling Engagement Project
Ogilvy & Mather, New York
2007
[Click for PDF](#)

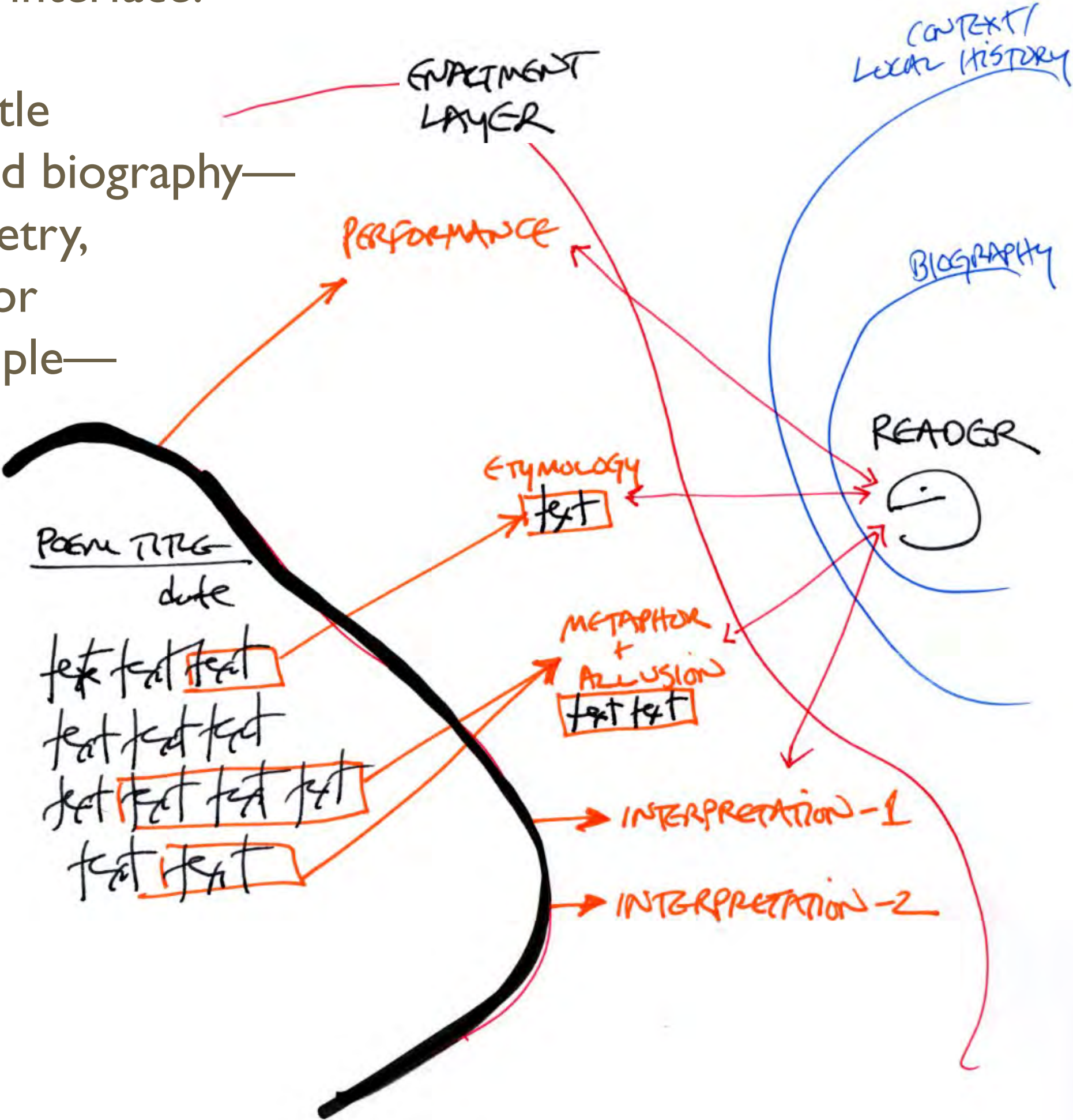
Designing Engagement / Poetry Machine



poetrymachine's storehouse of enactments creates a dynamic software interface.

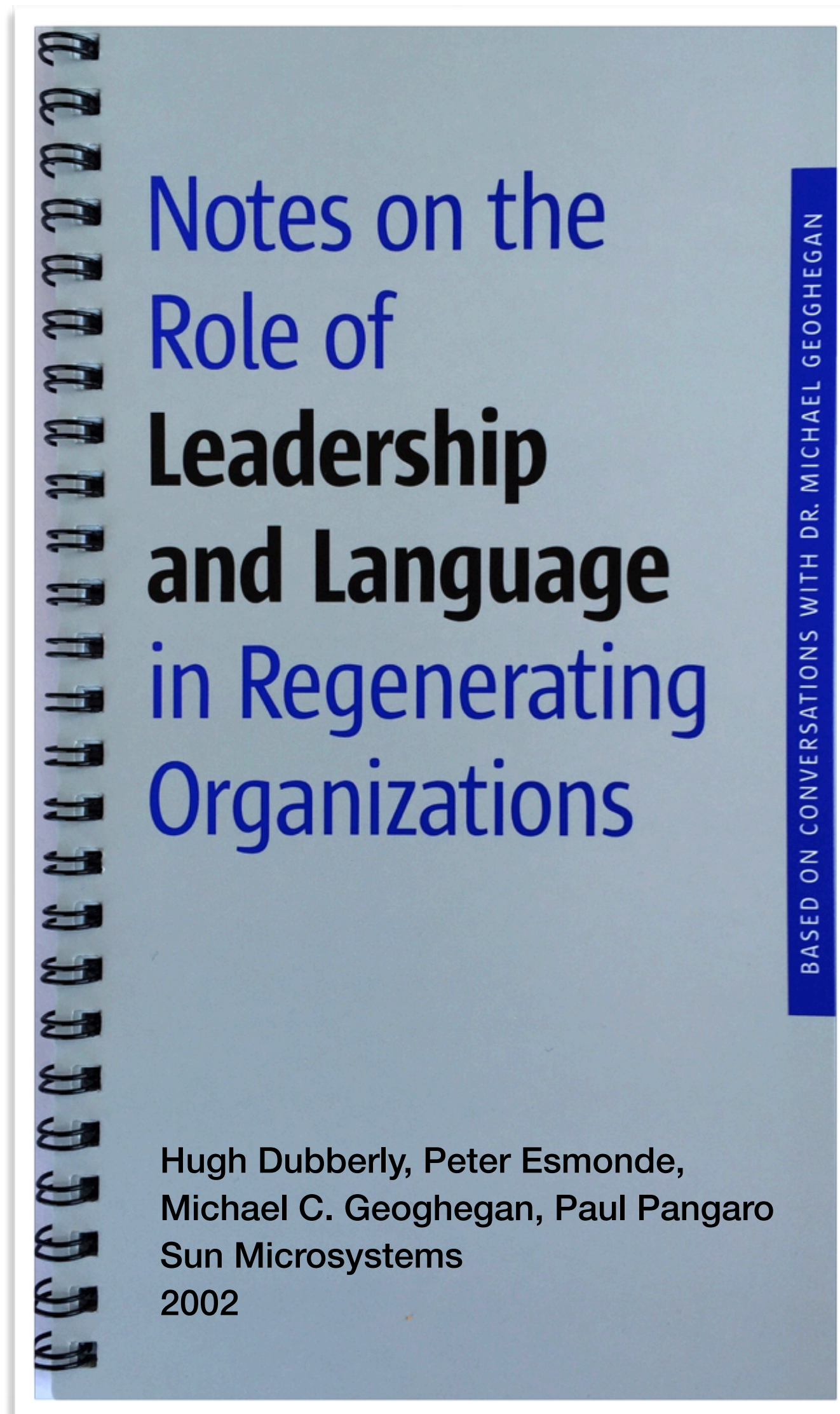
if poetrymachine knows a little about a reader's context and biography—level of experience with poetry, purpose in seeking poetry, or prior poems read, for example—it can create a personalized enactment layer by choosing specific elements of enactment to present to that specific reader.

the enactment layer enables a dialog that connects poem & reader, poet & reader, reader & self.



Paul Pangaro
Poetry Machine Project
PoetryMagazine.org, Chicago
2008

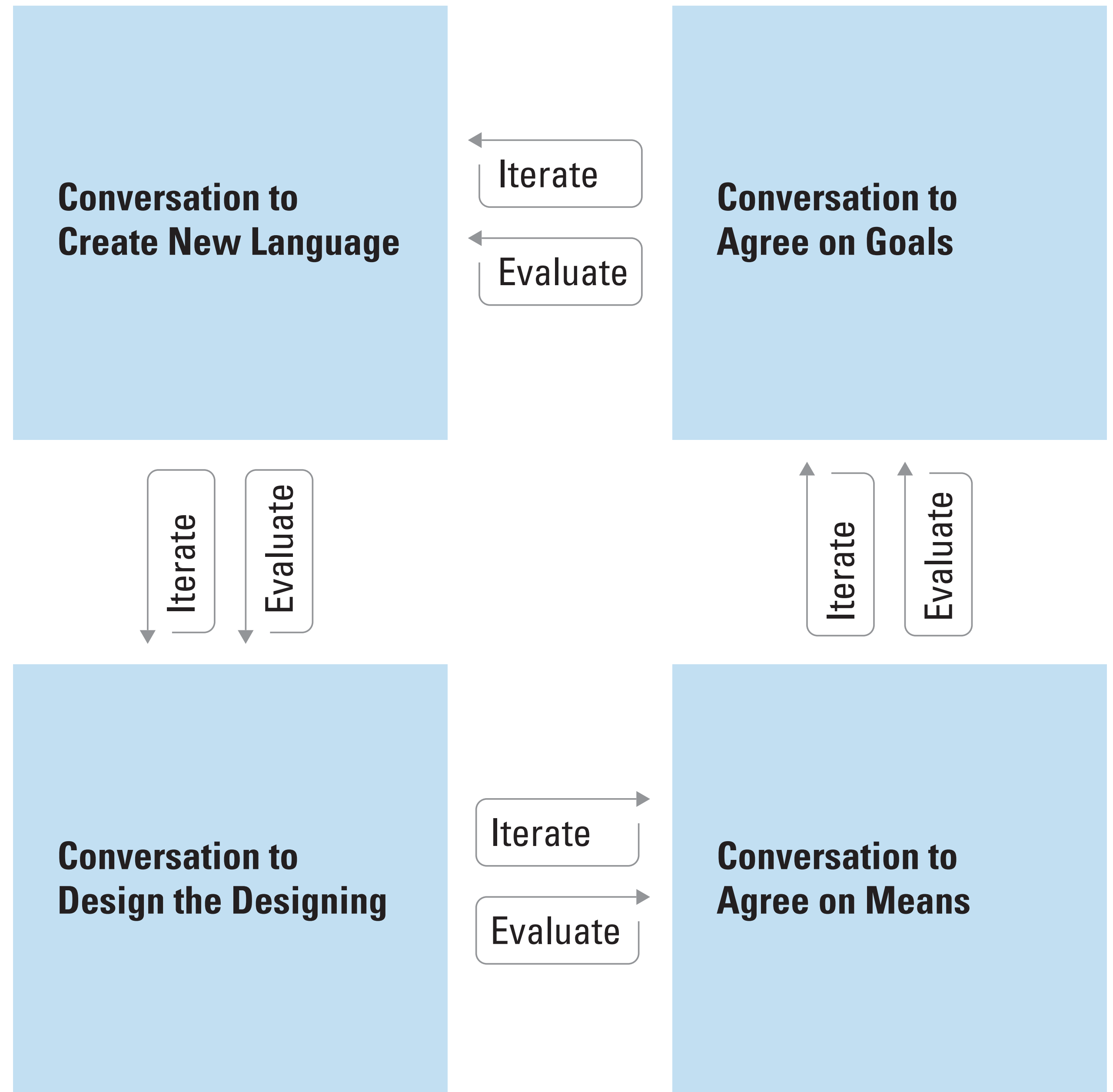
Designing Engagement / Conversations for Organizational Change



An organization
is its **language**.

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

Design as Conversation / Conversations for Design



Paul Pangaro
“Designing Our World:
Cybernetics as Conversation for Action”
Heinz von Foerster Lecture,
University of Vienna
2017
[Click for PDF](#)

Appendices

Design for Conversation

Paul Pangaro

pangaro.com/hciiseminar2019/

ppangaro@cmu.edu

thoughtshuffler

thsh.servehttp.com:8084/&SEL@T64&HLS?artificial|intelligence;study;journal;science;theory&PPG?""&RSP@M0?0&UID?8016

thoughtshuffler 20-Dec-2012

KEYWORDS

cybernetics

Artificial Intelligence

study

study

Journal

control

science

theory

+

SOURCES

google.com

+

<p>Cybernetics - Merriam-Webster O...</p> <p>... cy ber net ics. noun plural but singular in construction \ s -b r- netiks\. Definition of CYBERNETICS. : the science of communication and control theory that is ...</p> <p><i>from merriam-webster.com</i></p>	<p>cybernetics -- Britannica Online E...</p> <p>... Control theory as it is applied to complex systems. Cybernetics is associated with models in which a monitor compares what is happening to a system at various ...</p> <p><i>from britannica.com</i></p>	<p>Cybernetics - A Definition</p> <p>... Artificial Intelligence and cybernetics: Aren't they the same thing? Or, isn't one about computers and the other about robots? The answer to these questions is ...</p> <p><i>from pangaro.com</i></p>	<p>Cybernetics and Systems Theory</p> <p>... The following links provide general background information on the field of Cybernetics and Systems Theory, an interdisciplinary academic domain.</p> <p>...</p> <p><i>from pcp.lanl.gov</i></p>	<p>cybernetics - definition of cybern...</p> <p>... cy ber net ics (s b r-n t ks). n. (used with a sing. verb). The theoretical study of communication and control processes in biological, mechanical, and electronic ...</p> <p><i>from thefreedictionary.com</i></p>	<p>What are Cybernetics and System...</p> <p>... Cybernetics and Systems Science (also: "(General) Systems Theory" "Systems Research") constitute a somewhat fuzzily defined academic domain, that ...</p> <p><i>from pcp.lanl.gov</i></p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

+source get split +key suggest +source get split +key suggest +source get split +key suggest +source get split +key suggest +source get split +key suggest +source get split +key suggest

ThoughtShuffler
 UI design and coding by Jeremy Scott Diamond
 UX & heuristics by Paul Pangaro
 2012

national geographic, fracking, Hydraulic fracturing, water, oil, sand



March 2013 National Geographic Cover Story: "America Strikes Oil..."

nysfrackingunplugged.wordpress.com



In his article entitled "America Strikes **Oil**: The Promise and Risk of **Fracking**," Edwin Dobb, a Berkeley Graduate School of Journalism lecturer and **National Geographic** contributing writer, focuses **fracking** activities in North Dakota.



thoughtshuffler v3 iOS
UX by Miriam Simun
UI by See-ming Lee
concept & heuristics by Paul Pangaro
2013

qz.com

Starbucks is finally going to show US coffee drinkers what a “flat white” is. Prepare for controversy – Quartz

1/1/2015, 7:00:26 AM

Starbucks is introducing the “flat white” to its coffee menus across the US on Jan. 6, reports Eater. It’s a little surprising it took this long; the drink has been available for years in the UK and Australia, which both consume far less coffee per capita than the US. (It’s also a popular drink with New Zealanders, whose coffee consumption is on par with that of Americans.)

But good coffee is more about quality than quantity, is it not? Though the US is the birthplace of Starbucks, the most

thoughtstacks.com/m/#t

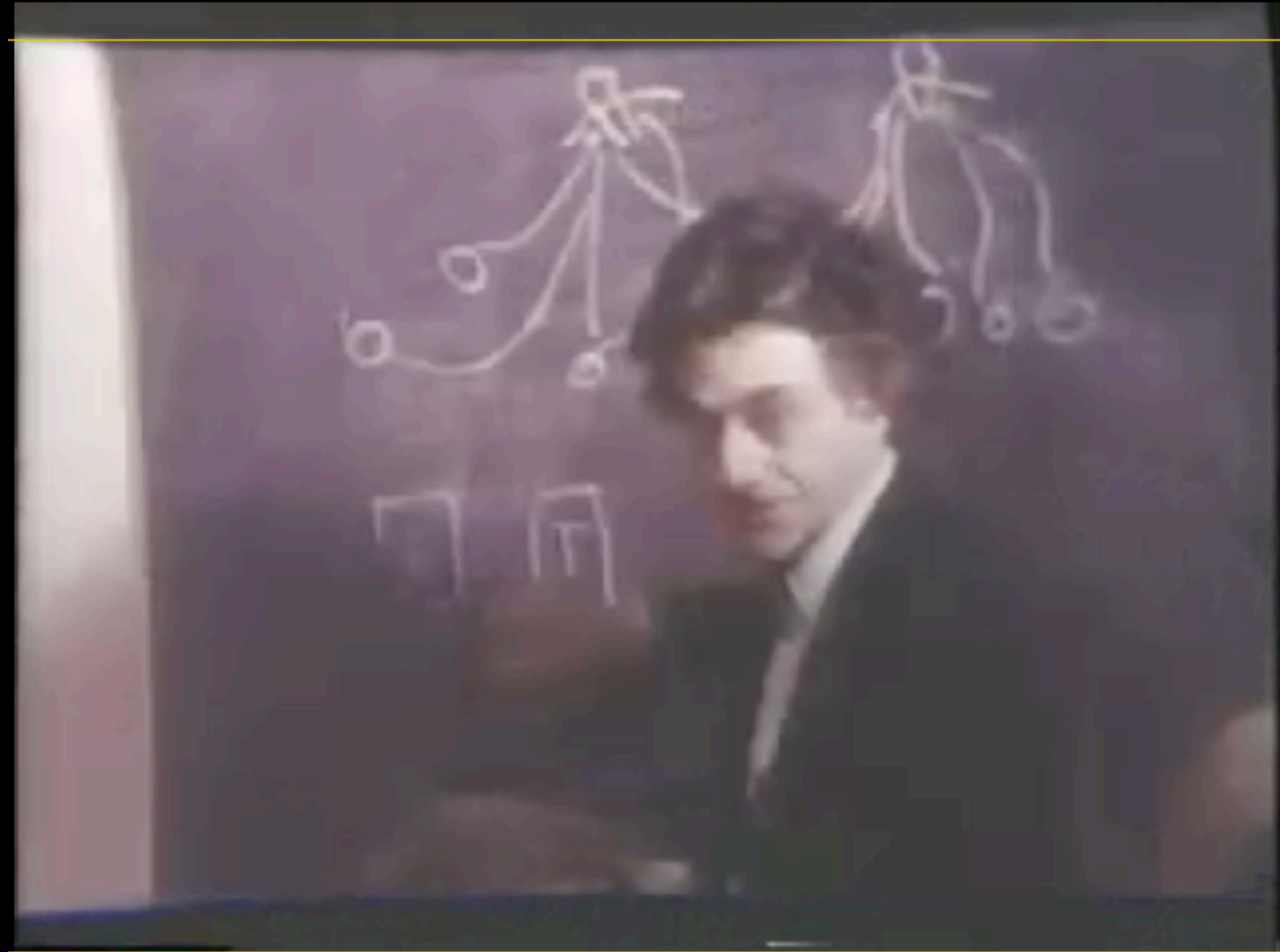
Appendices

Gordon Pask and Conversation

Paul Pangaro

pangaro.com/hciiseminar2019/

ppangaro@cmu.edu

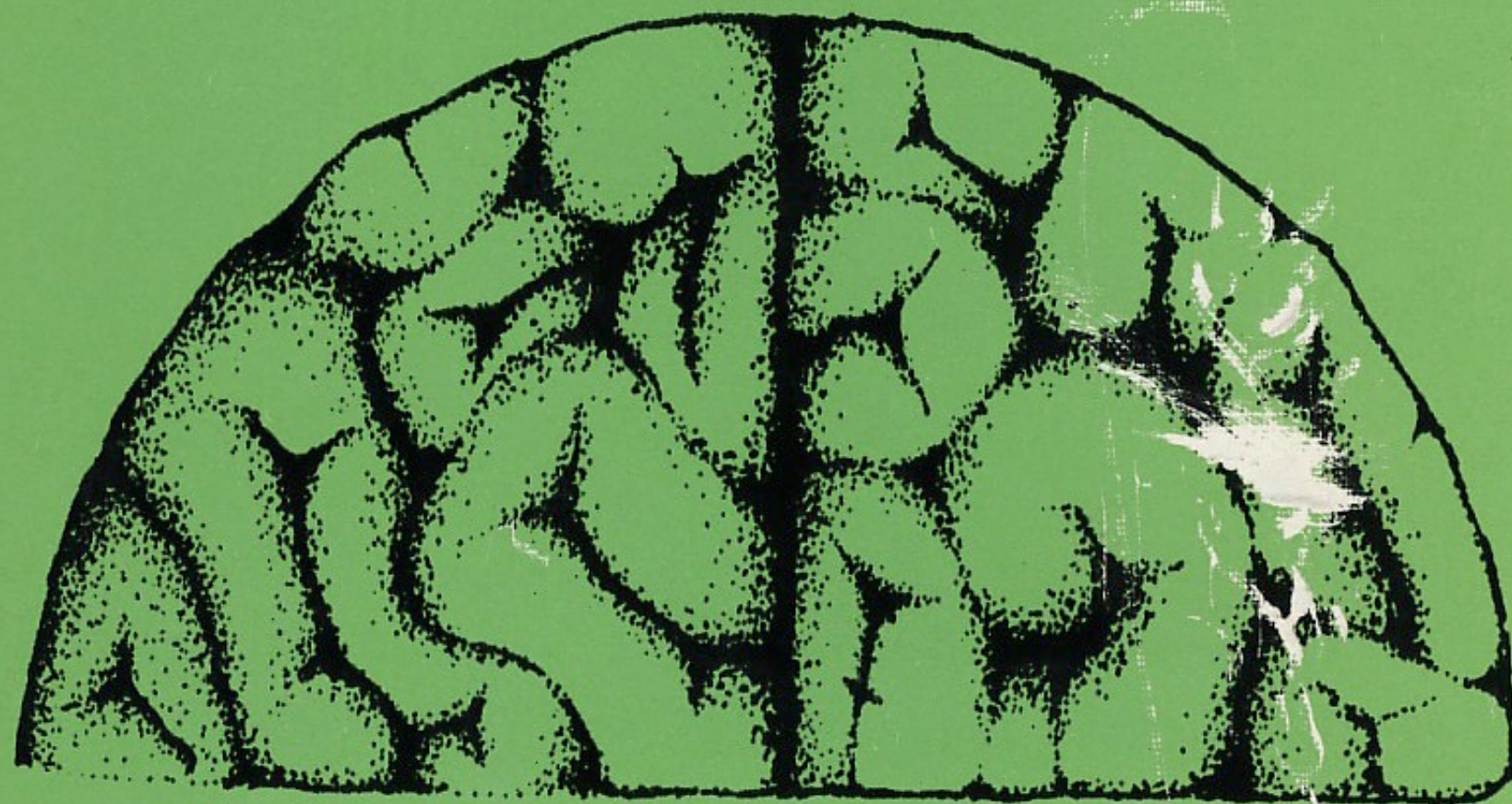


In 1975 Pask was the subject of an entire episode of the series **The Design Prototypeers** by the BBC.

[Click for video](#)

GORDON PASK

CONVERSATION,
COGNITION AND
LEARNING



A CYBERNETIC THEORY
AND METHODOLOGY

ELSEVIER

1975

GORDON PASK

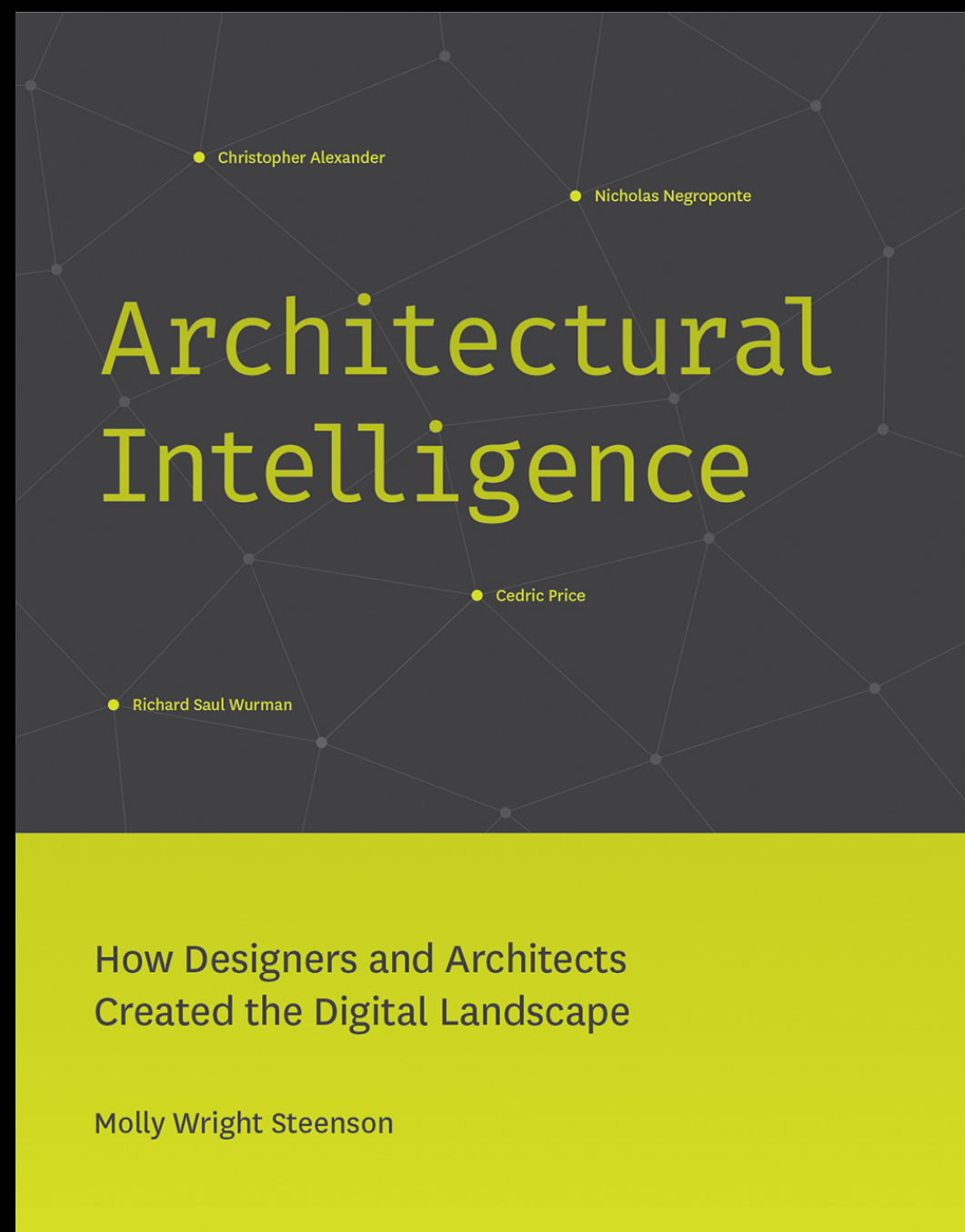
CONVERSATION
THEORY



APPLICATIONS IN EDUCATION
AND EPISTEMOLOGY

ELSEVIER

1976



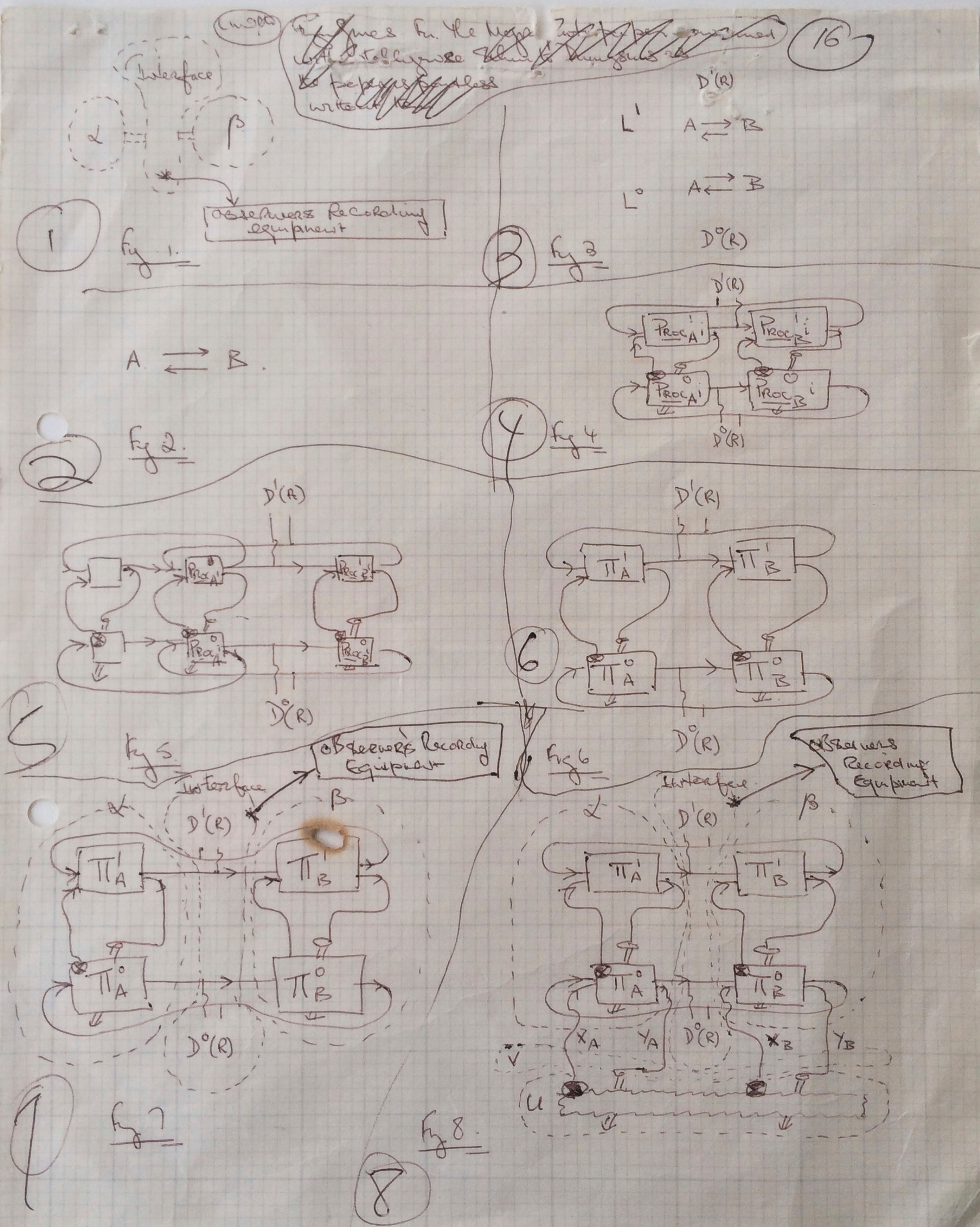
Architecture Intelligence
Molly Wright Steenson,
MIT Press, 2017

Soft Architecture Machines
Nicholas Negroponte, ed.,
MIT Press, 1976

[Click for PDF](#)

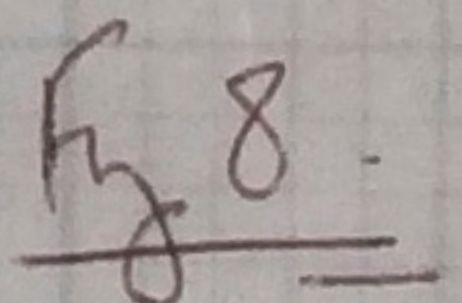
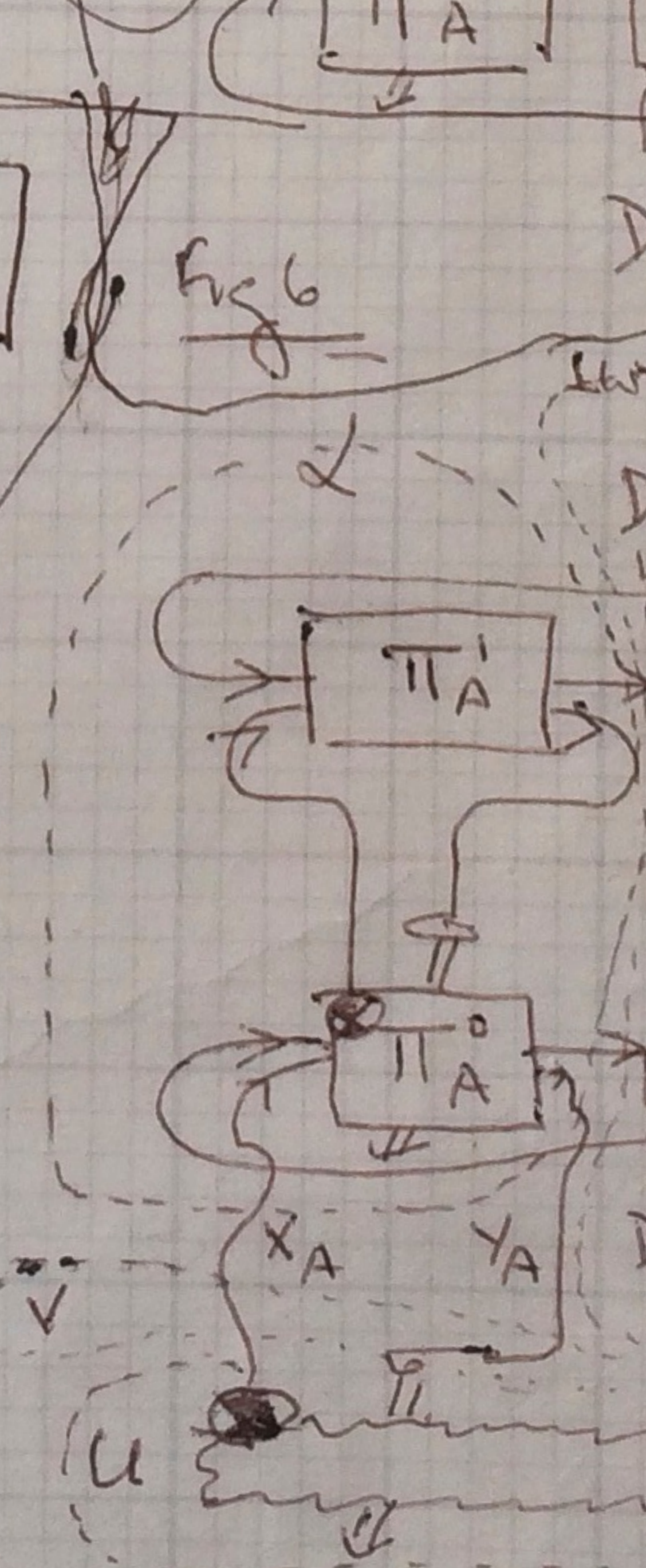
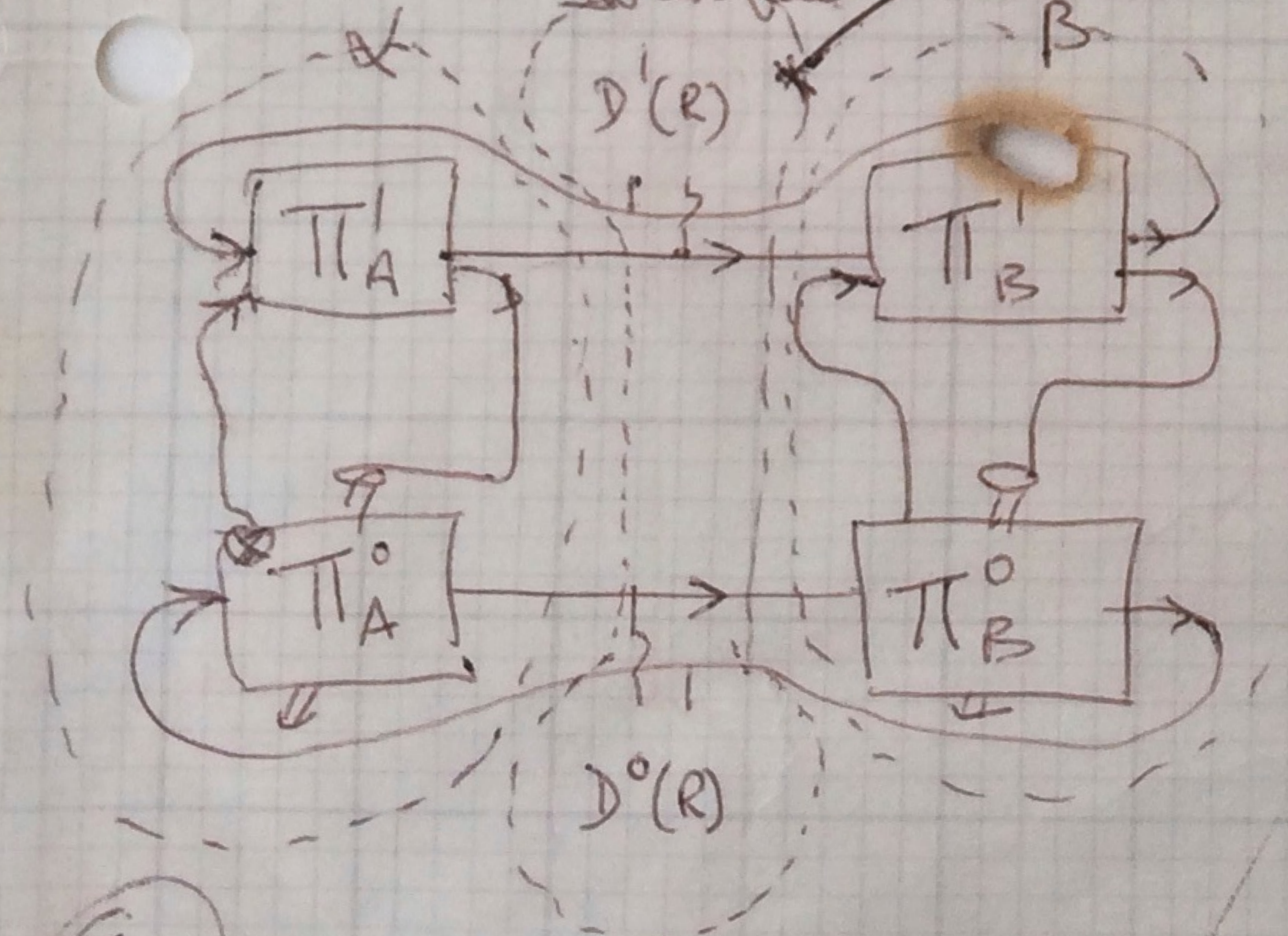
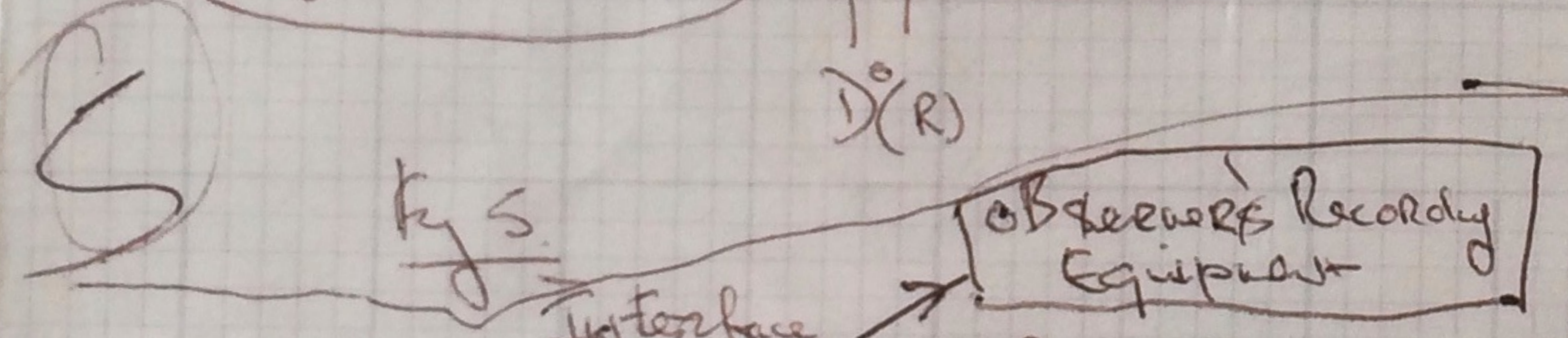
Book Design: Muriel Cooper





Pask's hand-drawn models of interaction are playful in spirit and rigorously complete.

They capture all types of interactions between participants in a conversation.



Aspects of Machine Intelligence

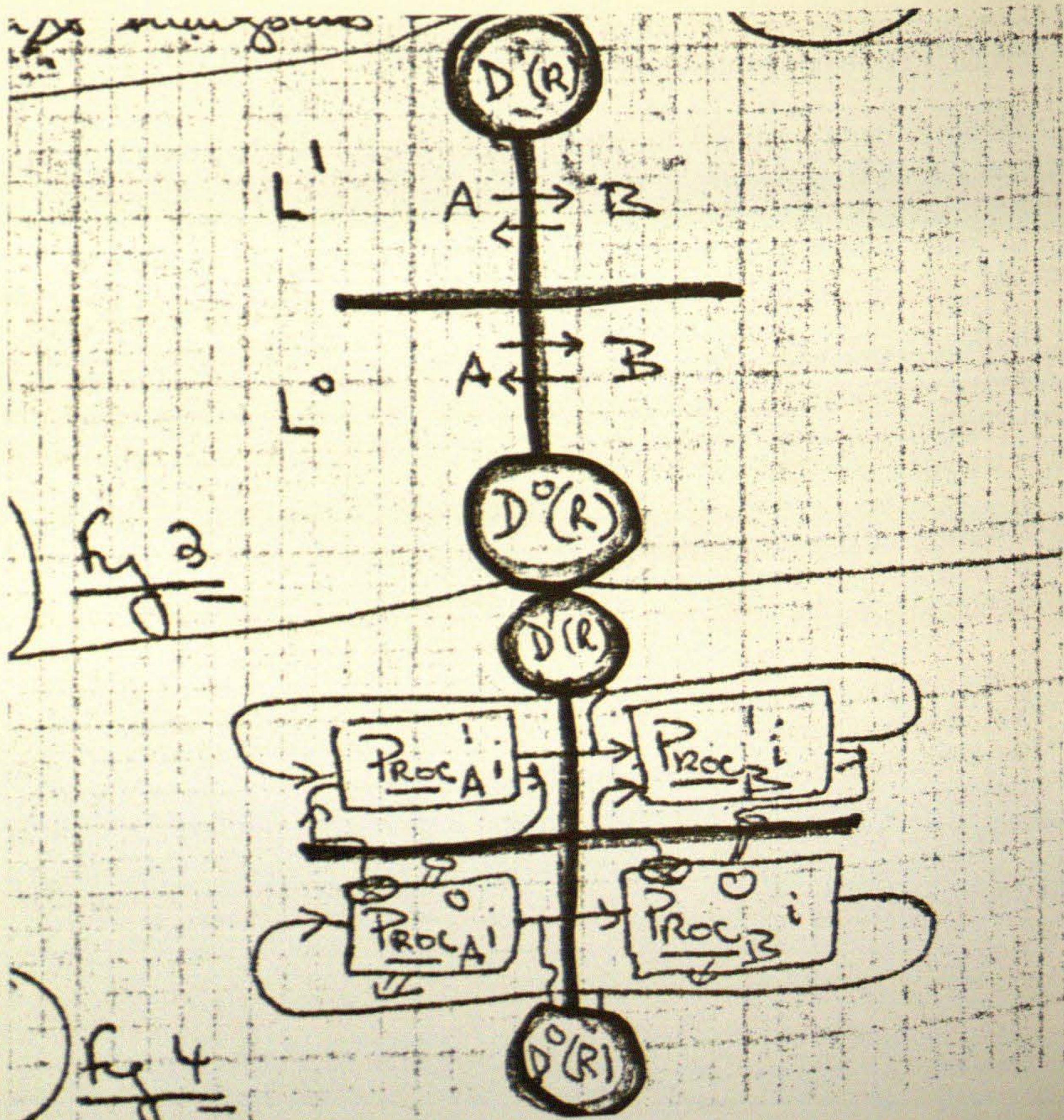
Introduction by Gordon Pask

The current status of mindlike computer programs is summarized, at a philosophical rather than technical level, in the following short but authoritative papers: Minsky (1968), Simon (1966), Turing (1969). Whoever wishes to delve into this subject in greater depth may read the books where these papers are published in their entirety, augmenting them, to obtain comprehensive background, by Ernst and Newell (1969); Ashby (1960); Cohen (1966); Fogel, Owens, and Walsh (1966); Von Foerster and Zopf (1962); Uttley (1959); Von Foerster et al. (1968); McCulloch (1965); Oestreicher and Moore (1968); Amarel (1969); Rose (1970); Minsky and Papert (1969); Feigenbaum and Feldman (1963); Banerji (1969); and Garvin (1970). It is also worth perusing all volumes of the journal *Artificial Intelligence*.

Henceforward, it is assumed either that the reader knows the *kind* of symbolic operations performed by computer programs and other artifacts, that he will study the matter at leisure, or that he will take these operations for granted. With this supposition in mind I shall give a personal and possibly idiosyncratic view of the conditions under which *artificially intelligent* is a properly used term and offer an interpretation of these conditions with respect to *use* of the *architecture machine*. Apart from the pictograms or ikons developed in the text, the only special symbols used are the special brackets \langle and \rangle which enclose *ordered* collections of objects; the equality sign $=$; and \triangleq , which is read as "*defined as equal to*."

Overview

The contention is as follows: Intelligence is a property that is ascribed by an *external observer* to a *conversation* between *participants* if, and



7.2. ♀ means "operates upon according to a hypothesis," and ⊗ means "gives a description (in the language appropriate to the level where the line terminates), which may or may not confirm the hypothesis."

7.3. Thus a complete circuit on one side of I , starting at ⊗, passing through — to a *Proc*, and returning by way of — and ♀ on the original *Proc* is a *causal coupling*, or, equivalently, it permits *reproduction* of the original *Proc*.

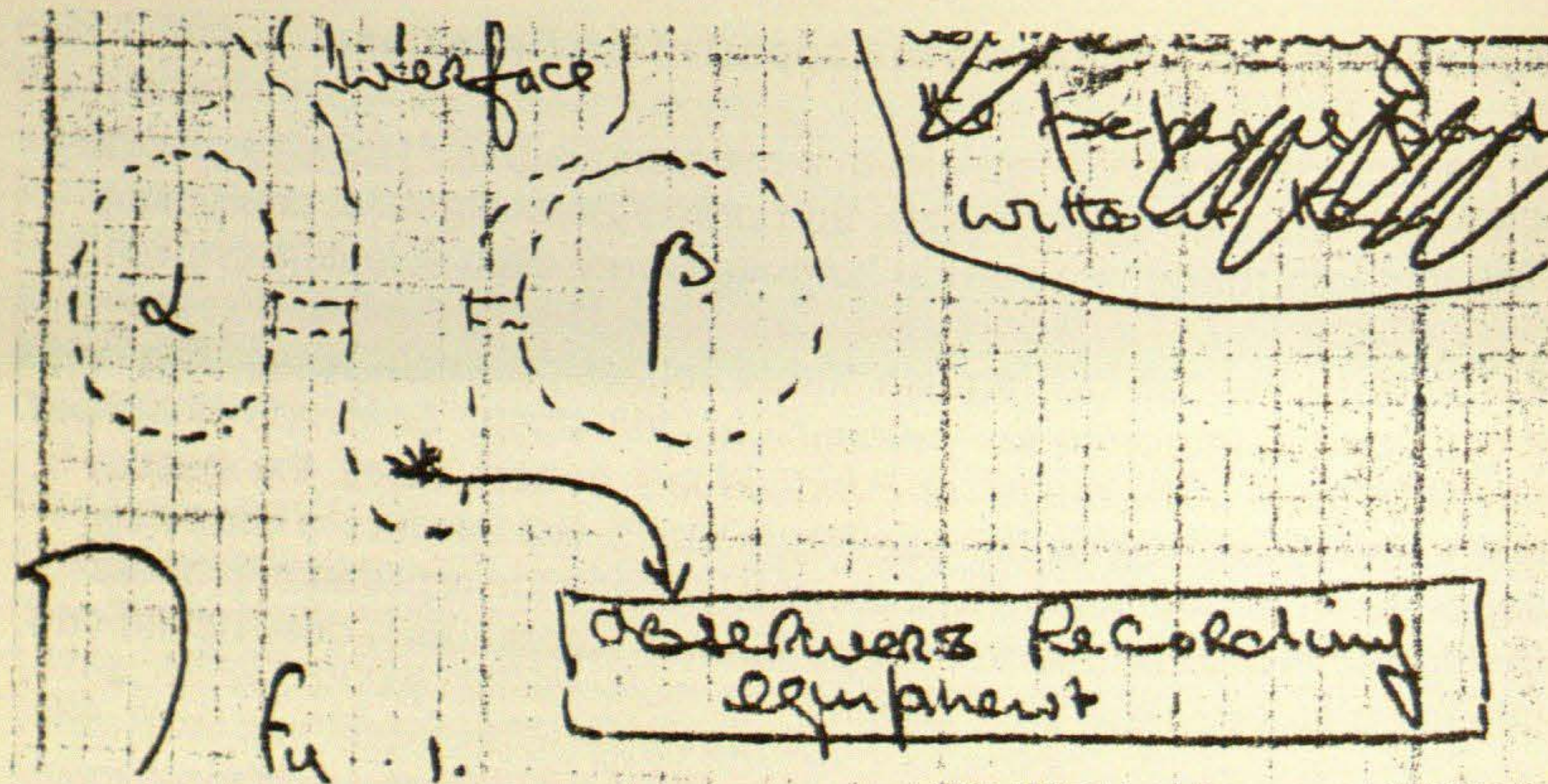
7.4. The unadorned, horizontal connections have a different meaning: they are *inferential couplings*, which, limiting cases apart, entail the notion of choice.

7.5. Hence, any complete circle (such as the line emanating from *Proc_A i* to *Proc_B i* and terminating on *Proc_A i*) may be called a *deductive chain*.⁵

7.6. Finally, the lines to and from $D'(R)$ and $D^\circ(R)$ indicate whatever is referenced by the inference, that is, whatever R_i in R is ostended by the participants A and B on occasion n .

7.7. Call this ikon (Figure 4) the *conversational paradigm*.

7.8. If one ikon is created by filling the spaces in Figure 3, then (obeying the proper rules) the process can be iterated laterally to yield a further *paradigm*, for example, the ikon in Figure 5. The motivation for doing so is noted in Section 2.1.1 ≙ to represent as much of mind as desired.



2.1.3. It is crucial to the argument that *all* observations occur at such a spatio-temporally localized interface; the observer's measuring and recording equipment is, in the last resort, bound to it. But the interface is neutral regarding the type of interaction, if any, that takes place across it.

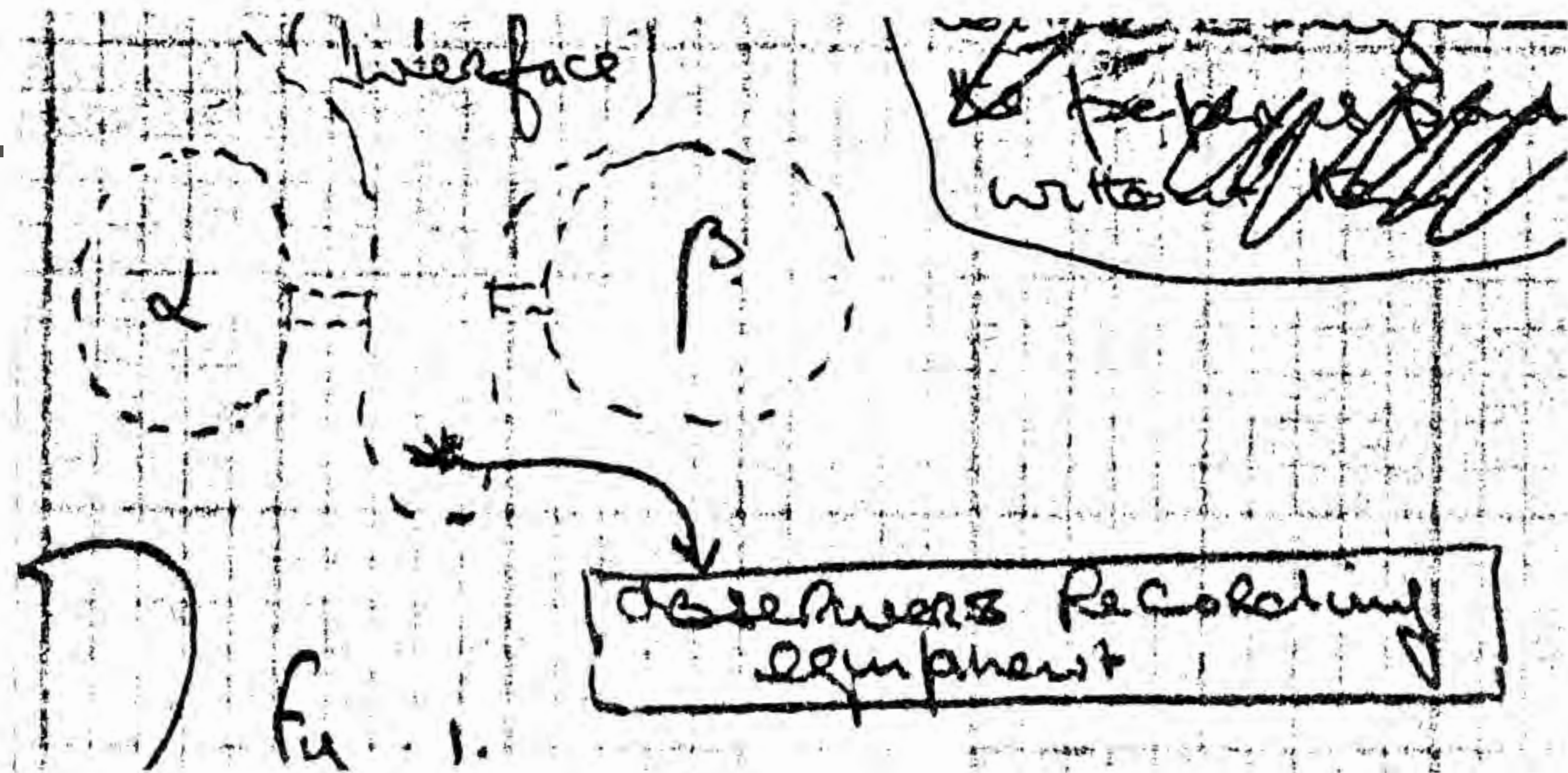
In Figure 1, which introduces the notation for distinguishing *M Individuals*, α may be a user of the architecture machine regarded as a biological unit and β the architecture machine regarded as a chunk of metal and semiconductor material. But α may also be a rat and β its experimental environment.

2.2. A *P Individual* is distinguished as a self-replicating and (usually) evolving *organization*. It is respectably and precisely defined in terms of an object language *L* and a relational domain *R* described in *L* by a description *D(R)* with respect to which it *is* self-replicating. Here, self-replication is intended in the abstract sense of the theory of reproductive automata, as originally conceived by von Neumann (1968) and as recently developed by Loefgren (1972).

2.2.1. Though, in general, the domain may be allowed to grow systematically under the control of the given *P Individual*, we confine our attention to cases in which *R* is fixed. Under these circumstances, it is possible to specify domains with the property that if a given *P Individual* is viable (that is, is able to reproduce) on occasion *n*, then it is also viable at any later occasion $n + r$ (*r* finite) for *R*, in *R*.²

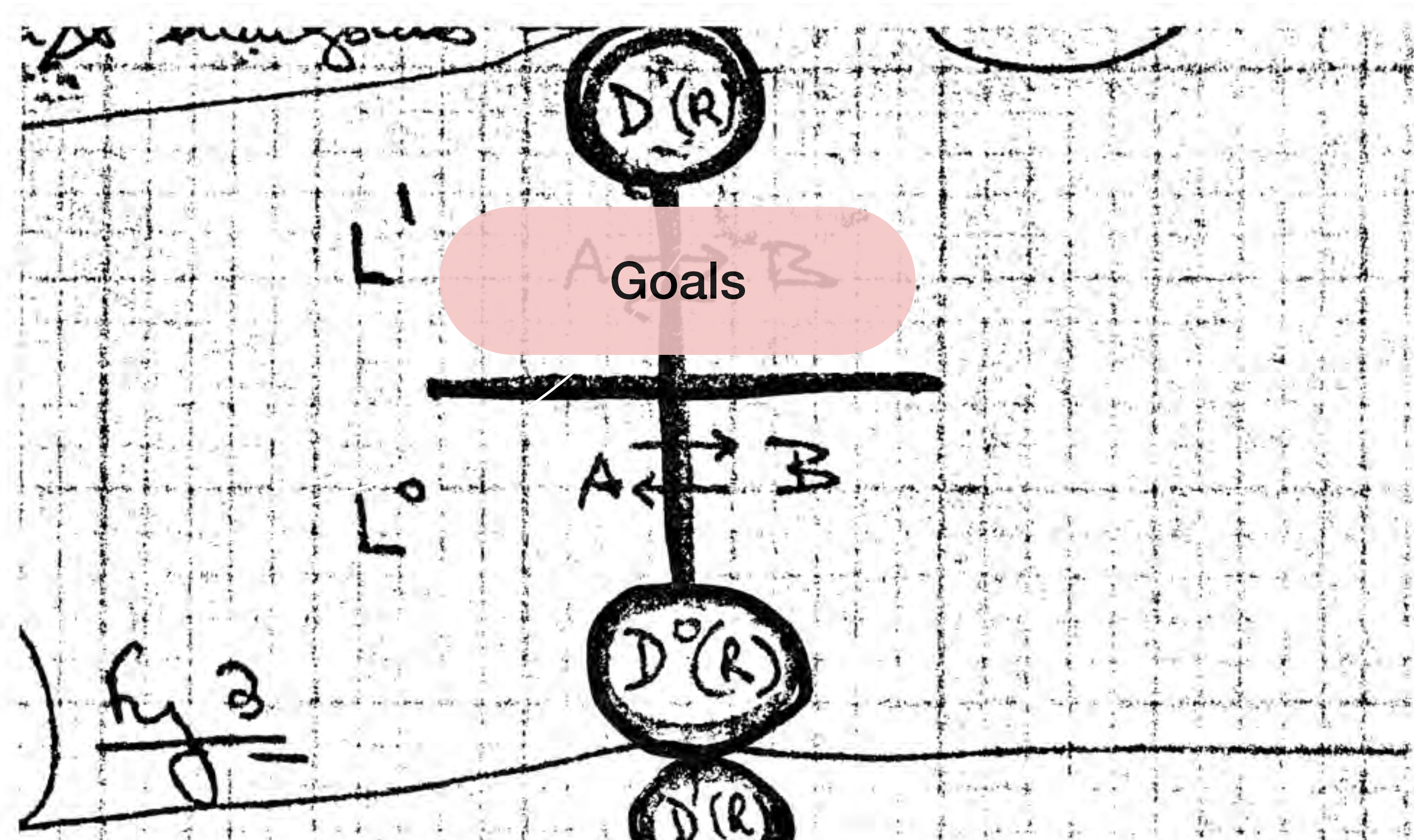
2.2.2. It is assumed that a *P Individual* is active or that any conversation in which it is a participant does in fact proceed, that is, for each occasion, some topic relation *R* (a part of *R* or all of it) is actually ostended for

Interactions occur through an interface.



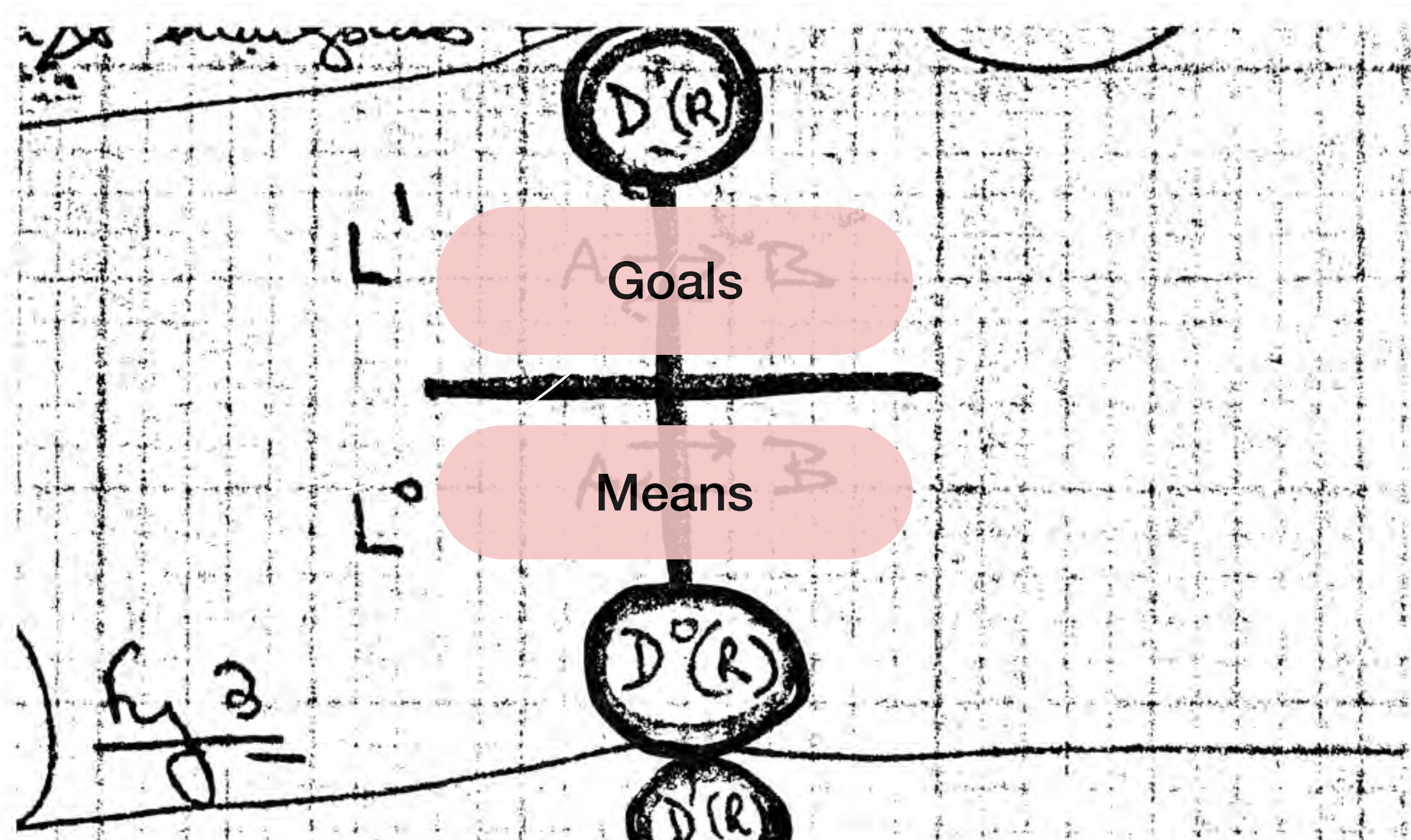
Gordon Pask.
"Aspects of Machine Intelligence"
In *Soft Architecture Machines*,
Nicholas Negroponte, ed., MIT Press
1976.

Interactions in a conversation can be observed to have levels of *goals* –



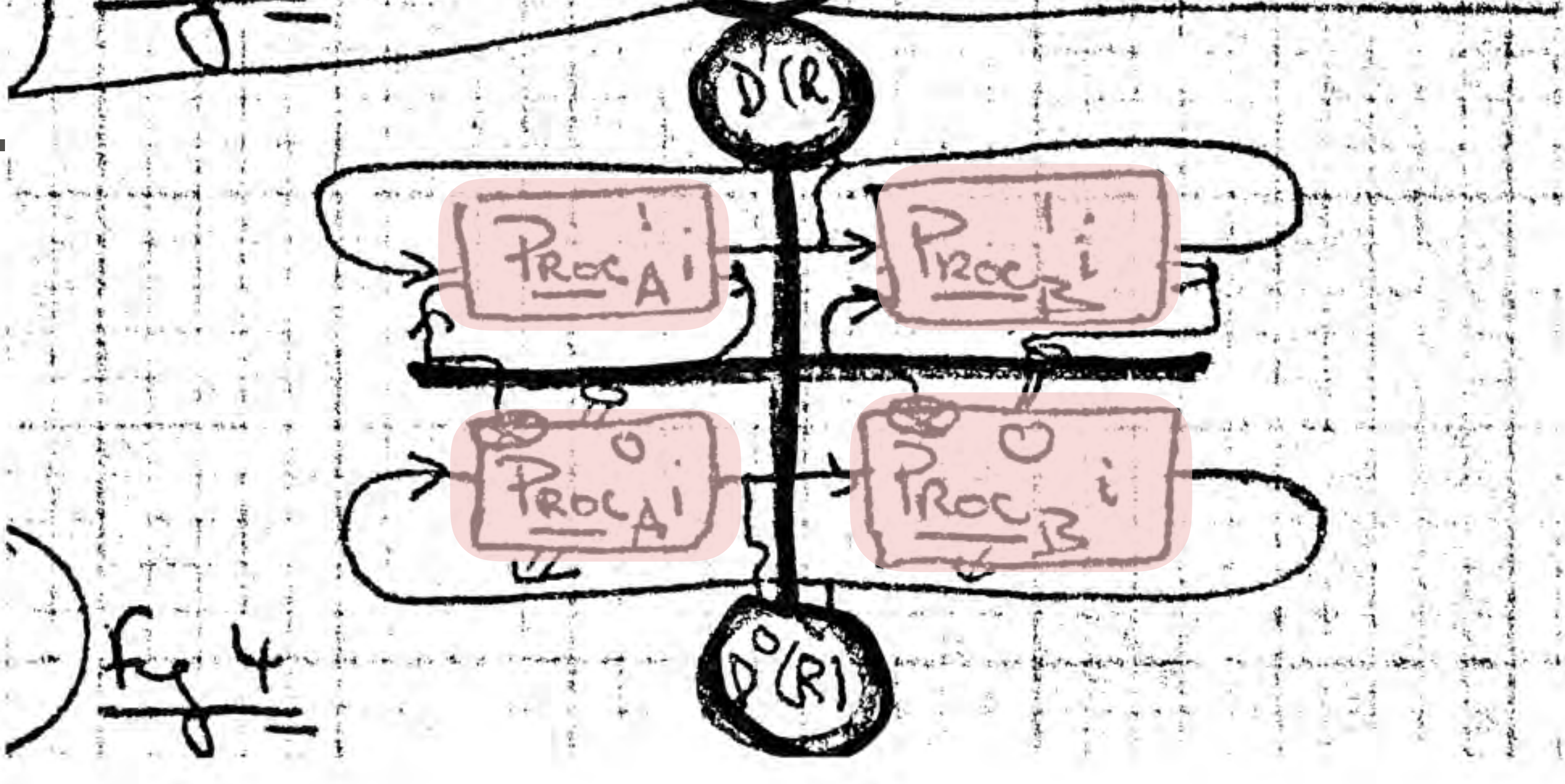
Gordon Pask.
“Aspects of Machine Intelligence”
In *Soft Architecture Machines*,
Nicholas Negroponte, ed., MIT Press
1976.

Interactions in a conversation can be observed to have levels of *goals* – and corresponding levels of *means* to achieve them.



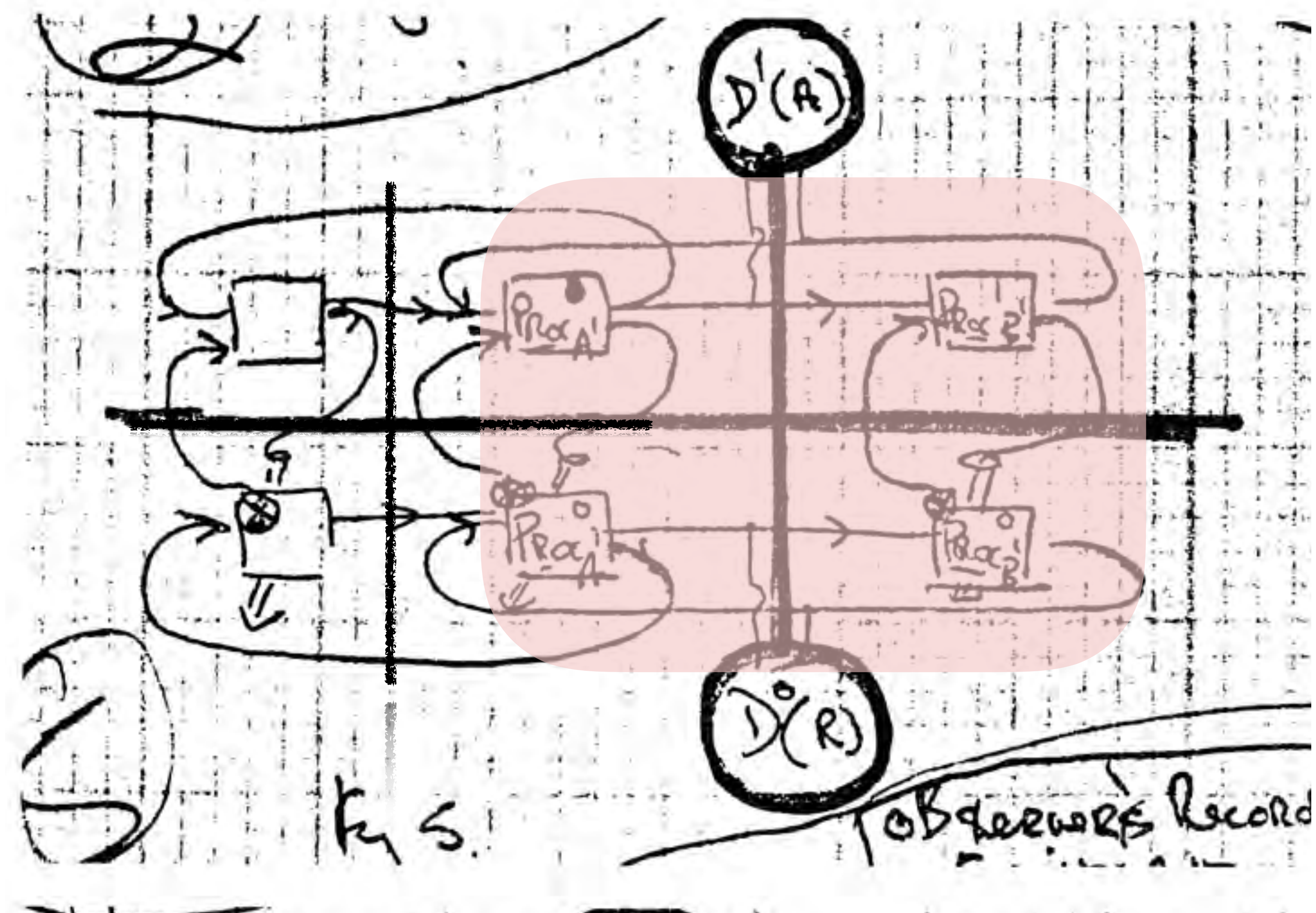
Gordon Pask.
“Aspects of Machine Intelligence”
In *Soft Architecture Machines*,
Nicholas Negroponte, ed., MIT Press
1976.

Conversations are driven by processes.



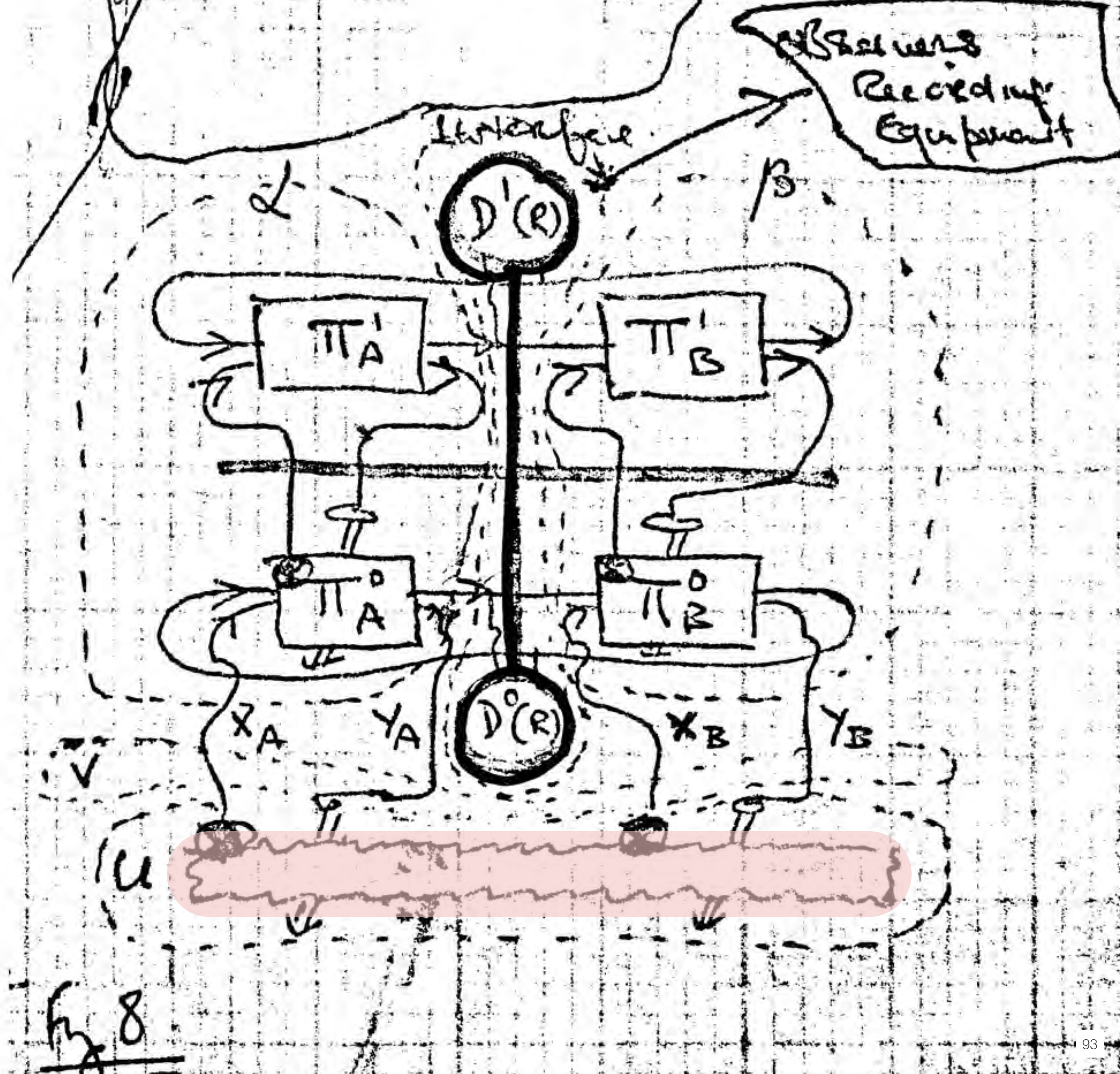
Gordon Pask
“Aspects of Machine Intelligence”
In *Soft Architecture Machines*,
Nicholas Negroponte, ed., MIT Press
1976.

Conversations have similar structures and processes, whether between persons or internal to one person.



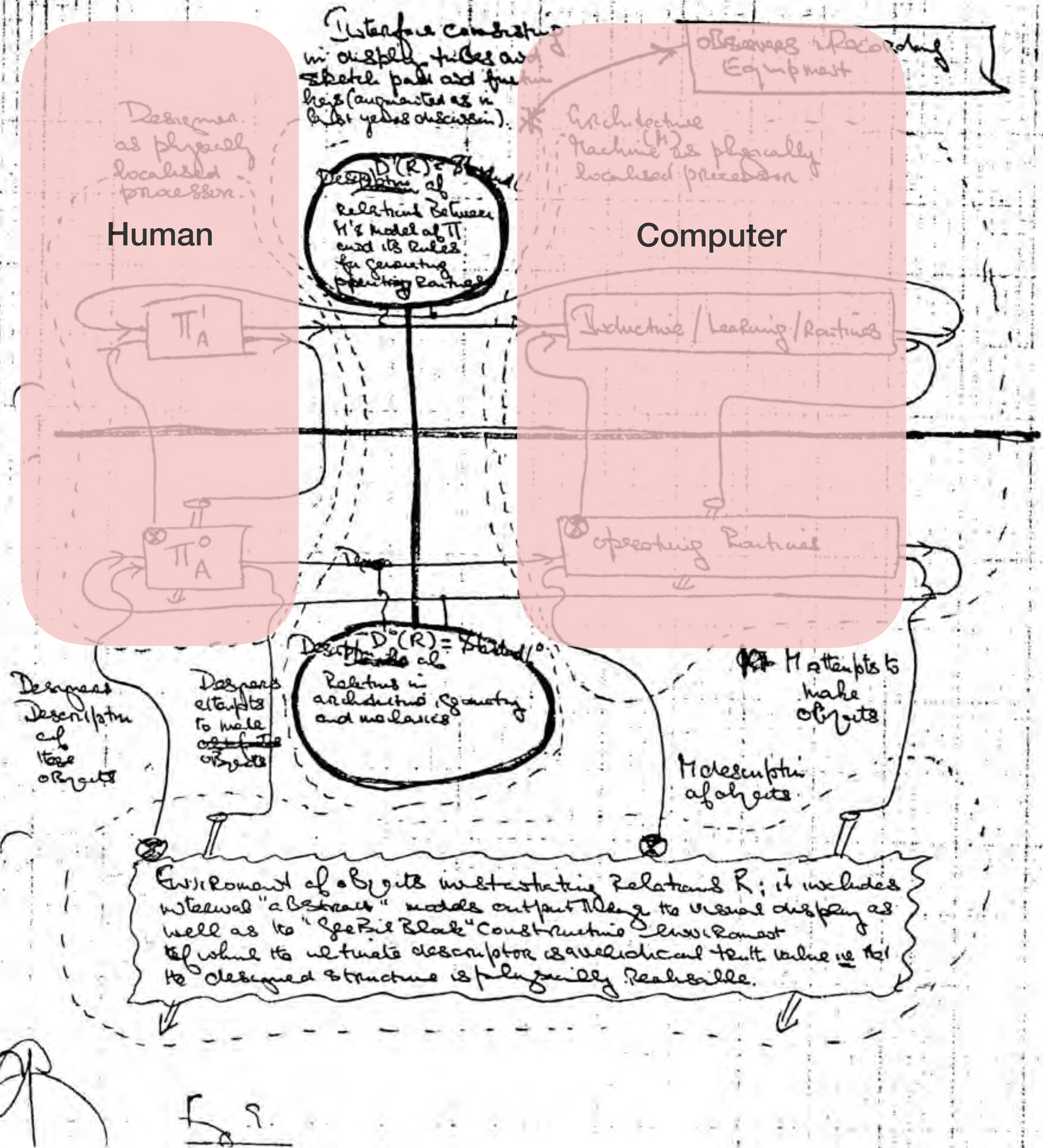
Gordon Pask
“Aspects of Machine Intelligence”
In *Soft Architecture Machines*,
Nicholas Negroponte, ed., MIT Press
1976.

Conversations may result in actions taken in an environment.



Gordon Pask
"Aspects of Machine Intelligence"
In *Soft Architecture Machines*,
Nicholas Negroponte, ed., MIT Press
1976.

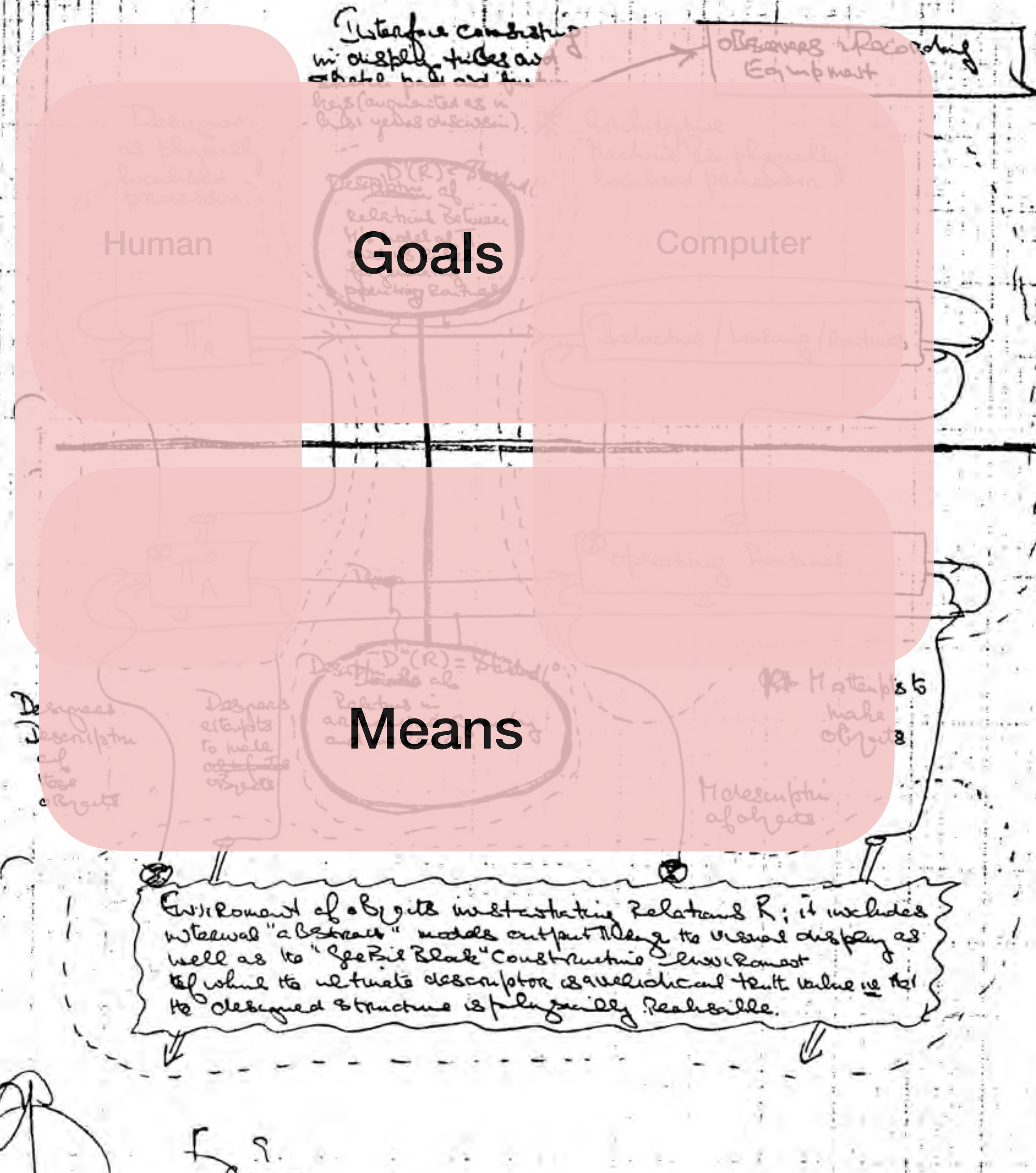
A computer can partner with a human in a conversation for design.



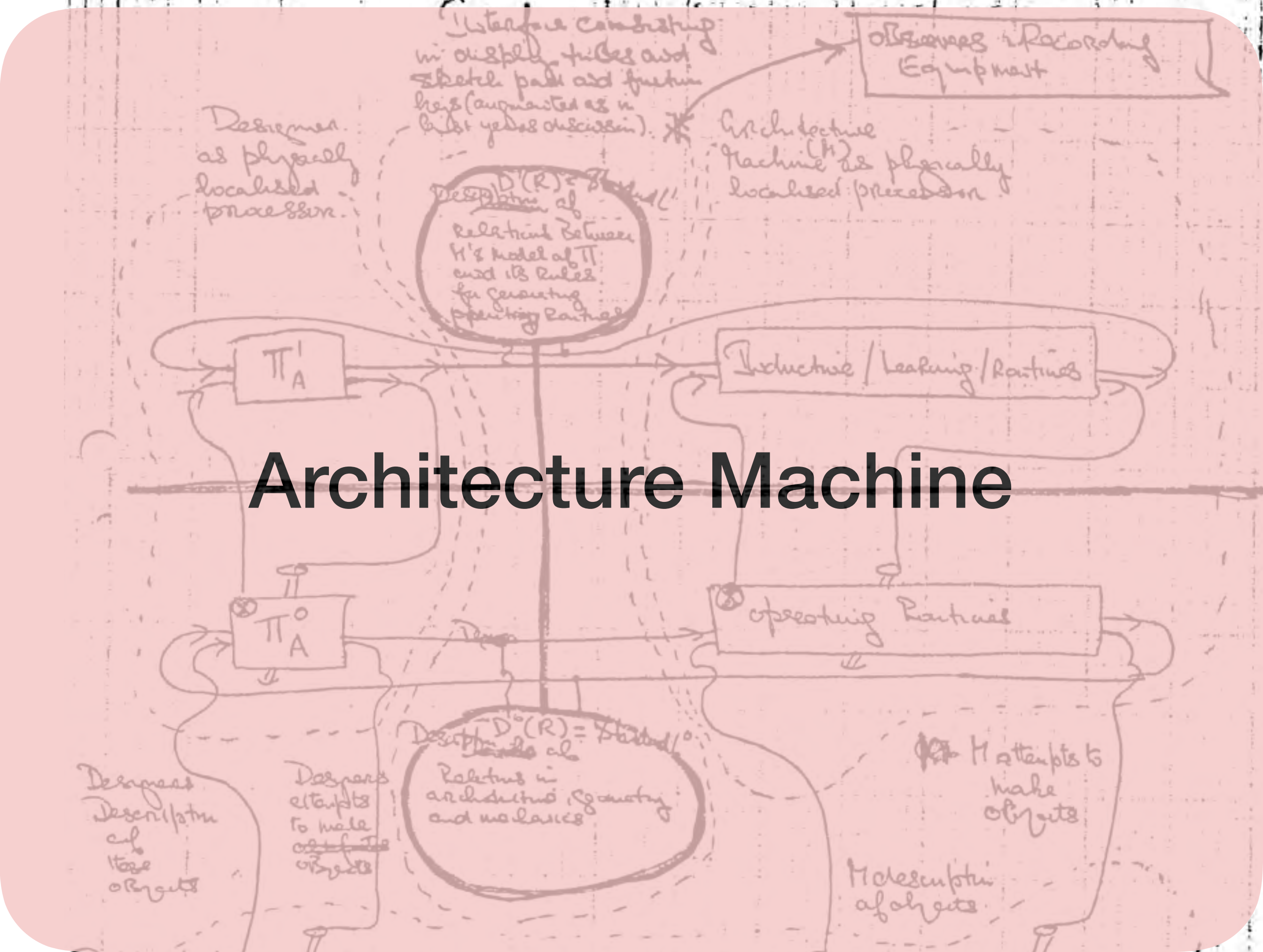
Gordon Pask.
 "Aspects of Machine Intelligence"
 In *Soft Architecture Machines*,
 Nicholas Negroponte, ed., MIT Press
 1976.

A computer can partner with a human in a conversation for design.

Gordon Pask.
 "Aspects of Machine Intelligence"
 In *Soft Architecture Machines*,
 Nicholas Negroponte, ed., MIT Press
 1976.



A computer can partner with a human in a conversation for design.



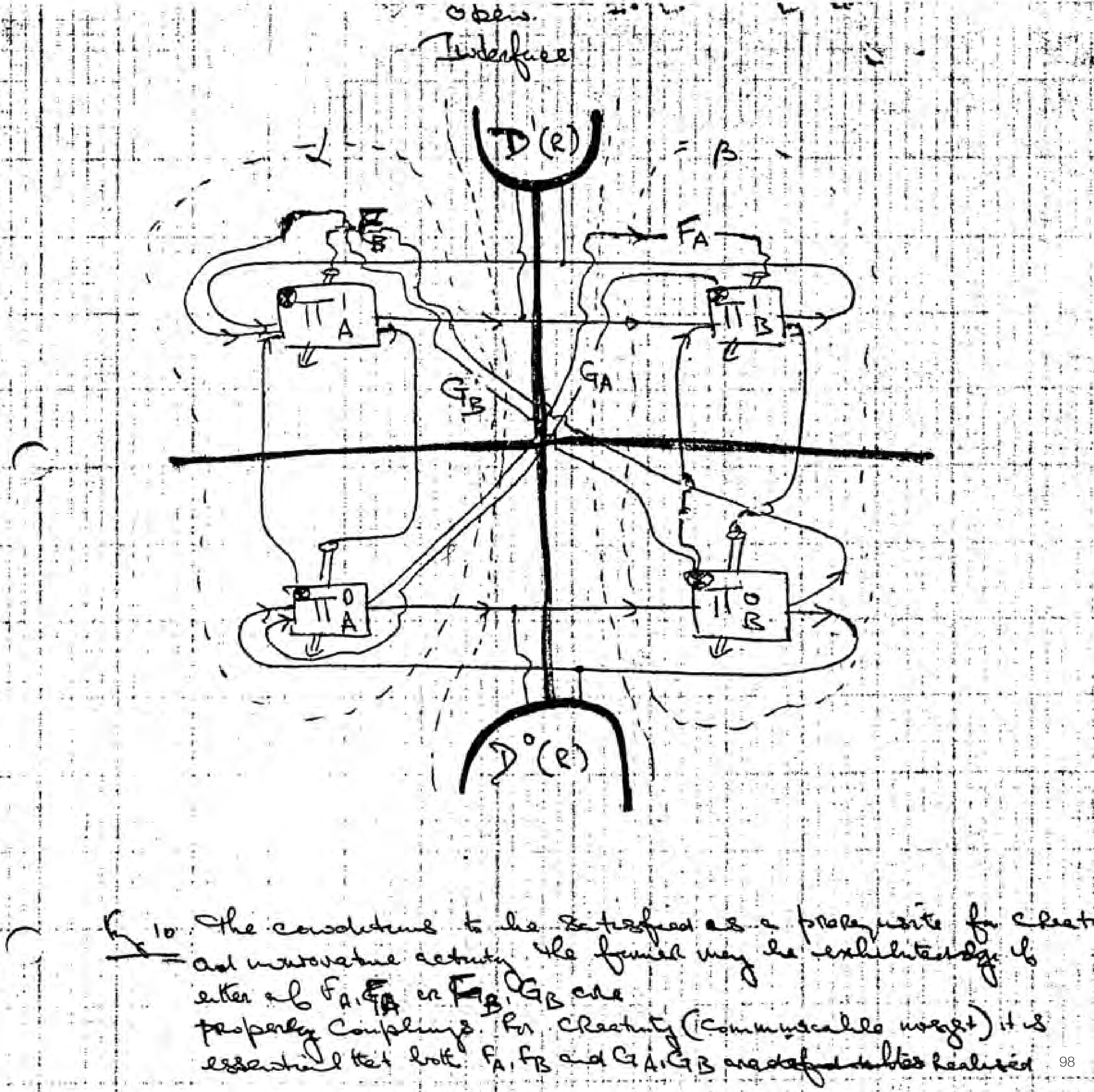
Architecture Machine

Gordon Pask.
 "Aspects of Machine Intelligence"
 In *Soft Architecture Machines*,
 Nicholas Negroponte, ed., MIT Press
 1976.

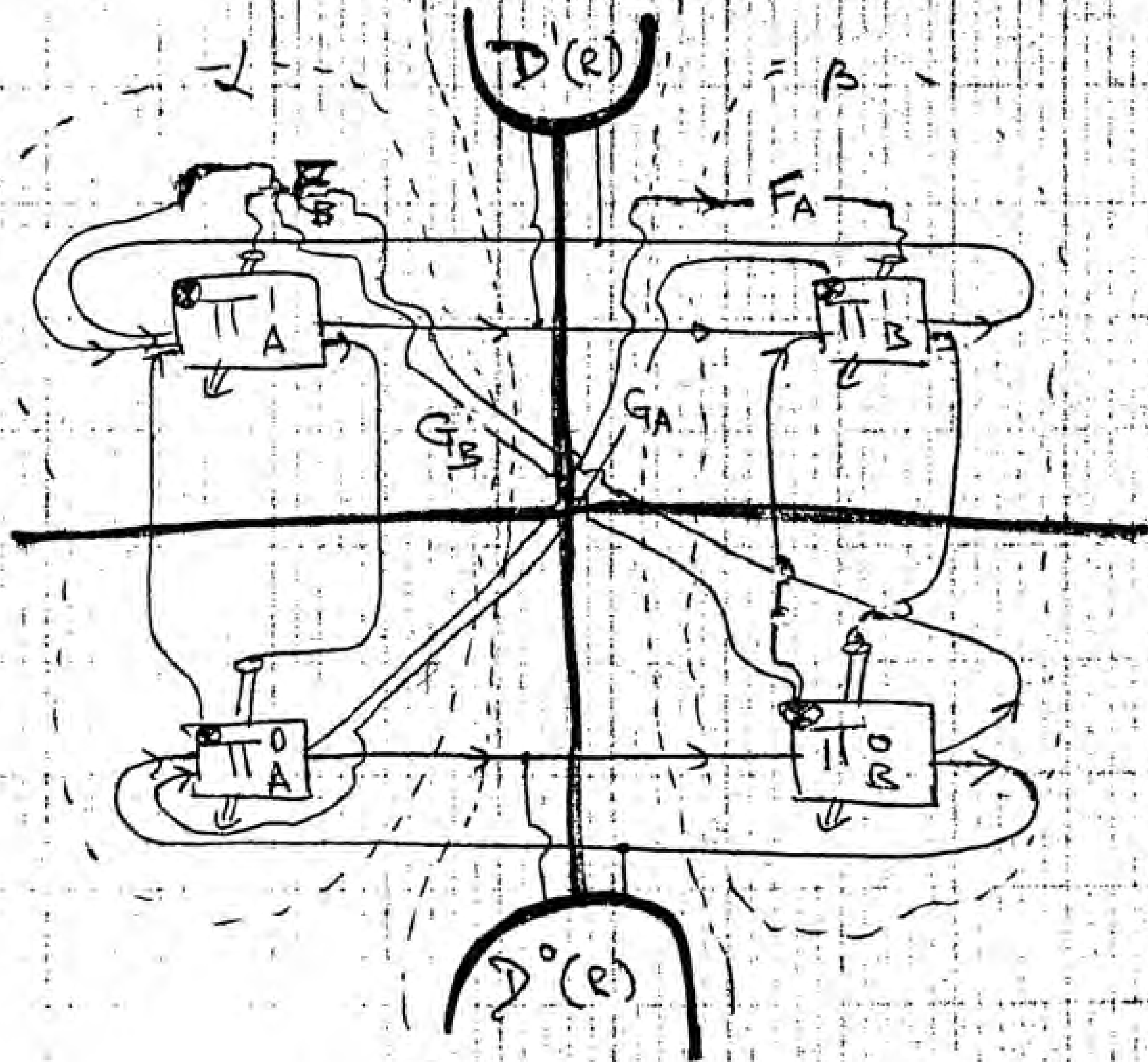
Environment of objects instantiating Relations R; it includes internal "abstract" model output along to visual display as well as to "See-It-Block" construction environment of which the ultimate descriptor is a visual truth value $v \in \{0,1\}$. The designed structure is physically realizable.

Conversation may be a **dance** where each participant construes the other to be part of a unified whole.

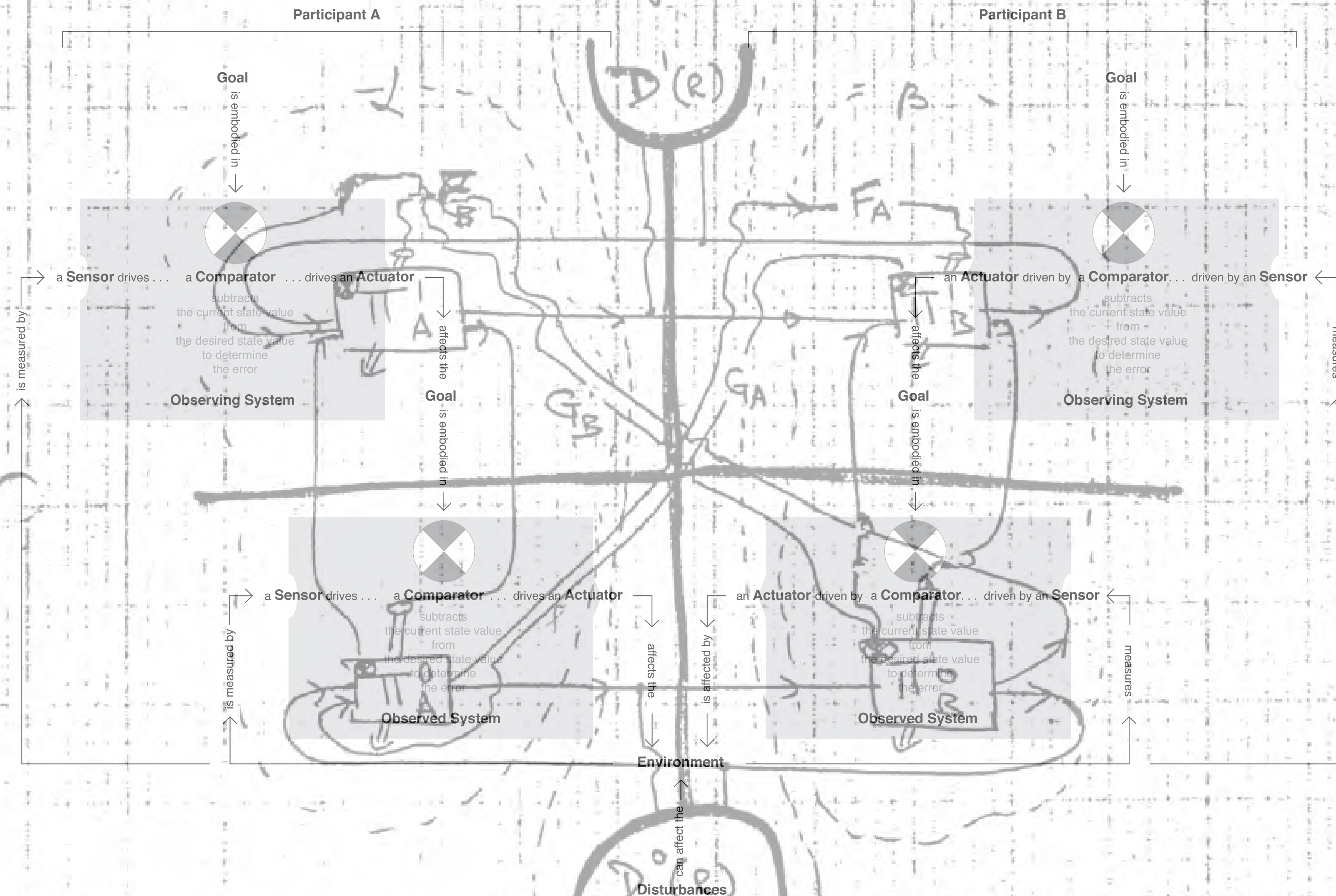
Gordon Pask.
 "Aspects of Machine Intelligence"
 In *Soft Architecture Machines*,
 Nicholas Negroponte, ed., MIT Press
 1976.



Open
Interface



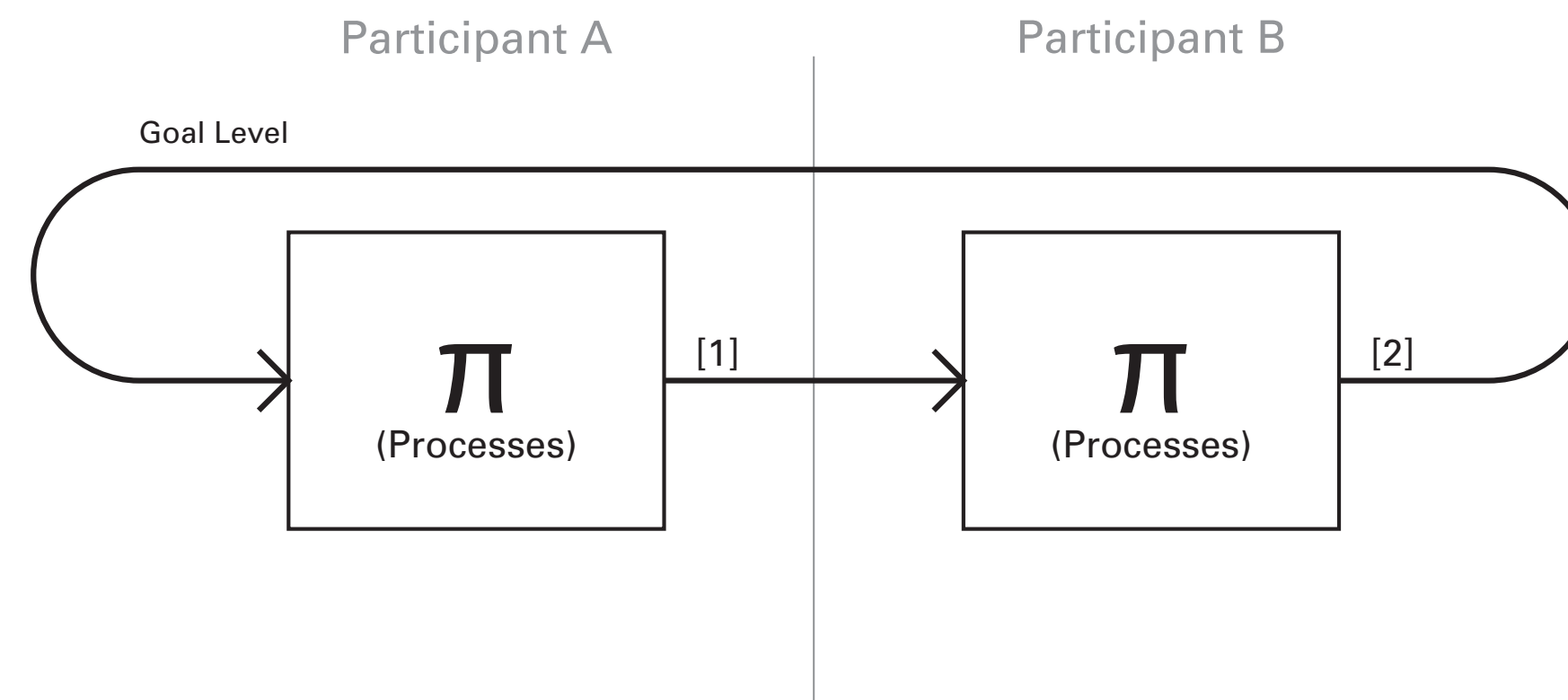
Conversation: Formal Mechanism



Conversation: Formal Mechanism



Conversation Theory after Pask



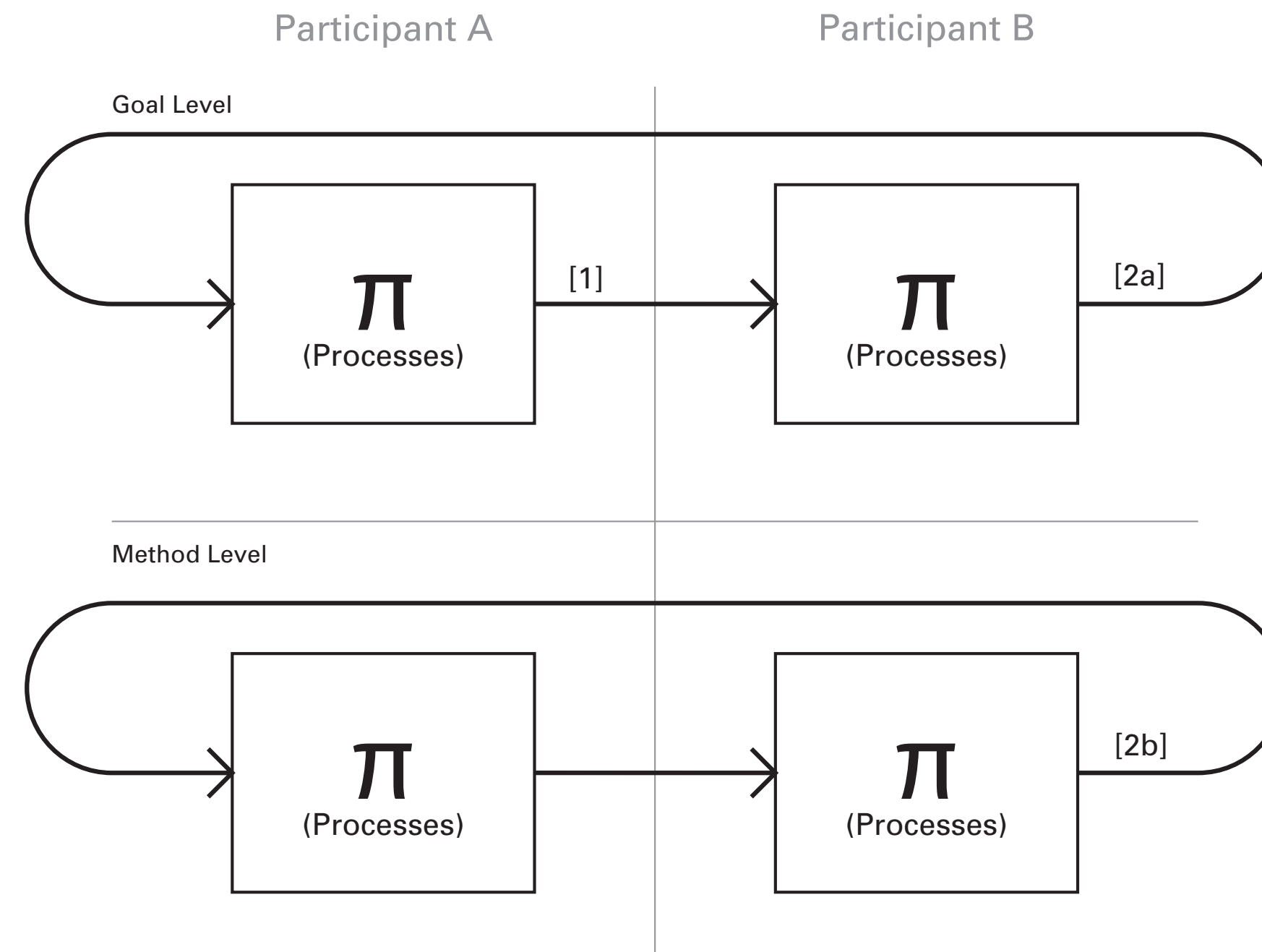
Example:

[1] A: Can I have a hamburger?

[2] B: Sure, you want fries with that?

Architecture of Conversation

Distinguishing Goals and Methods

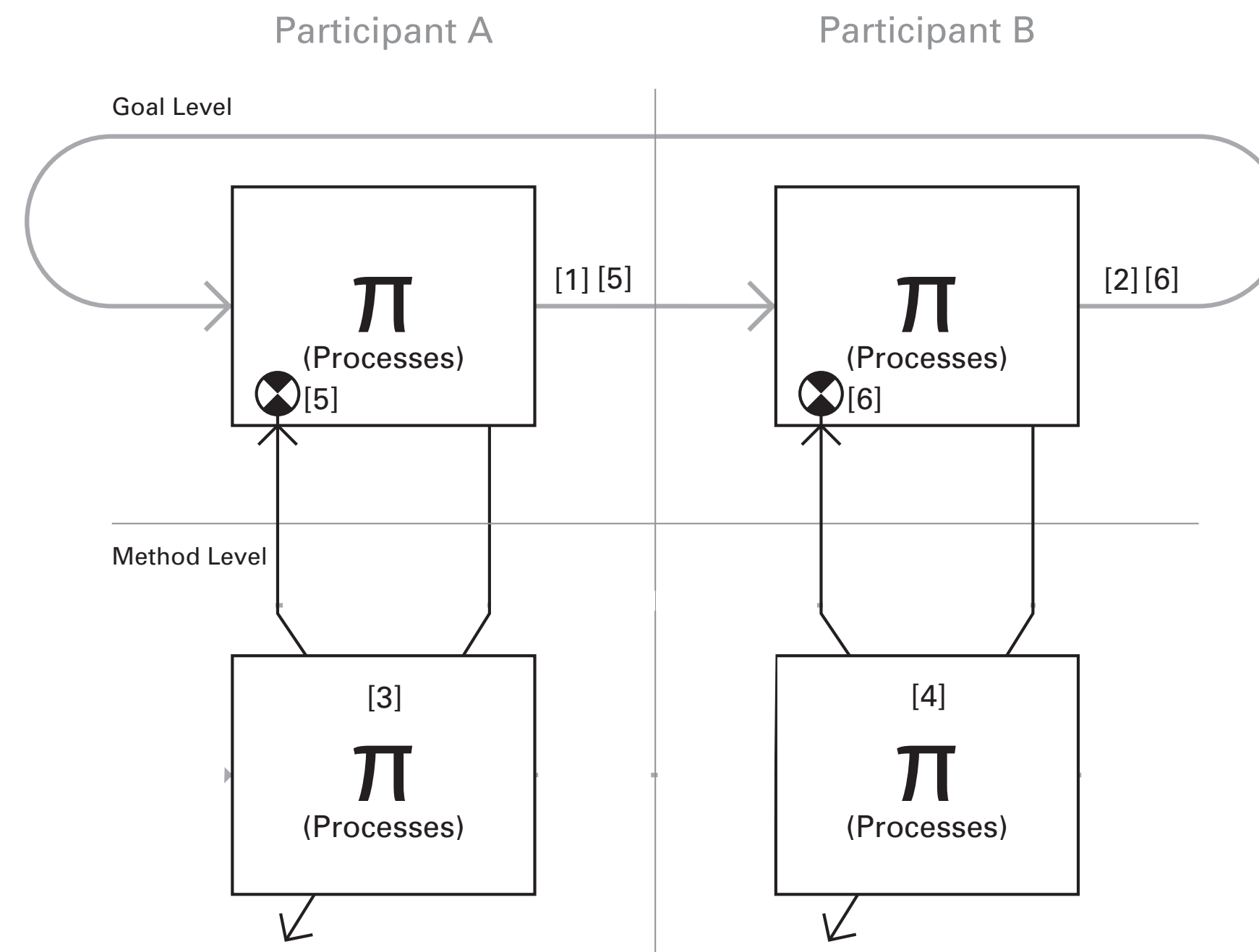


Example:

[1] Can I have a hamburger?

[2] [a]Sure, [b]you want me to make you one here or get takeout?

Conversation (Objective) Interactions with 'it'



Example:

[1] I'd like to have a hamburger for dinner.

[3] [Performs the actions of taking the meat out of the fridge, putting it on the grill, turning the grill on, watching until it's done, etc.]

[5] I've cooked the hamburger and achieved my goal.

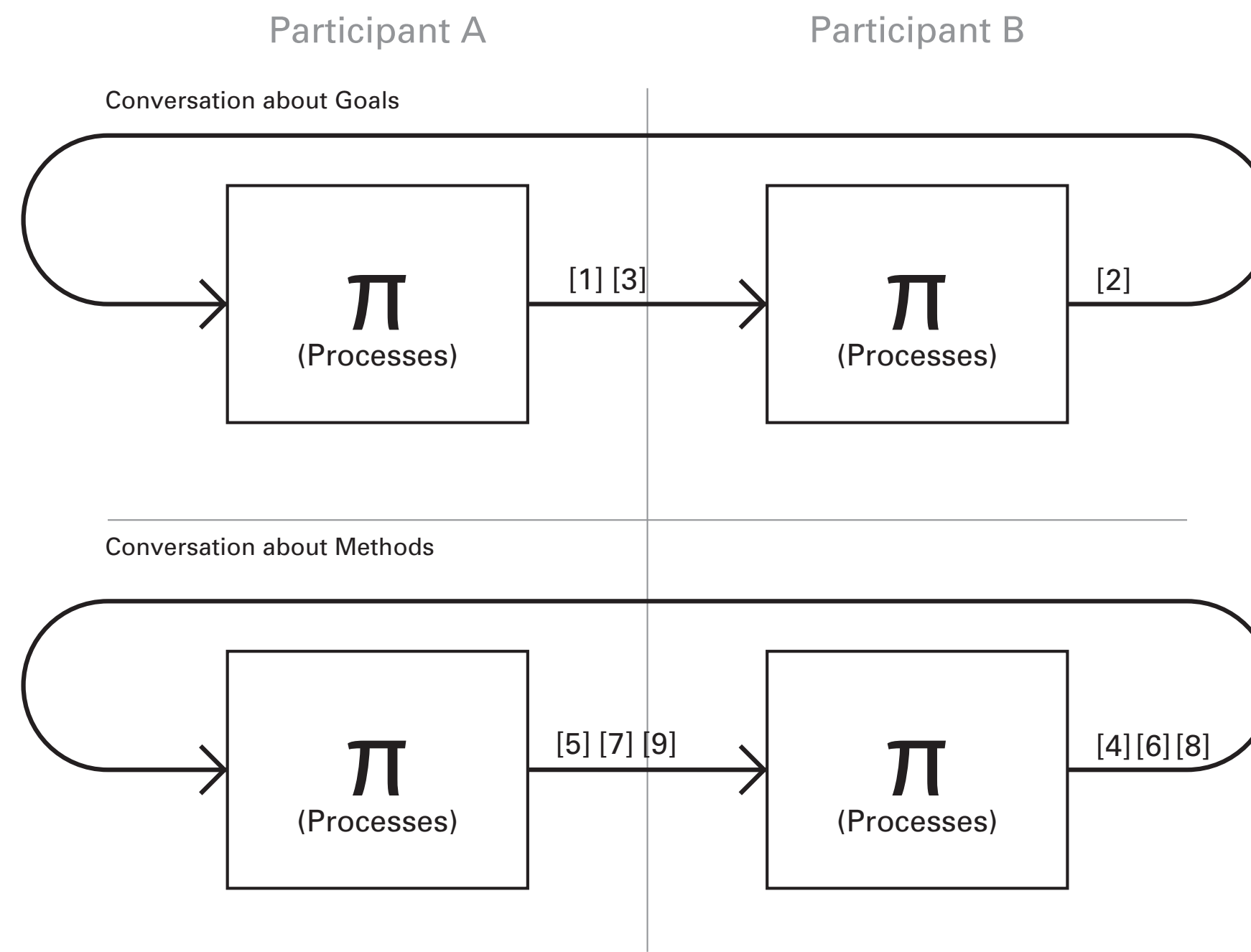
[2] I'd like to eat chicken. I'll go get takeout.

[4] [Gets coat, leaves the apartment, walks to the takeout place, orders the food, waits until it's done, pays for it, brings it home and then eats it.]

[6] I've eaten the chicken and achieved my goal.

Conversation (Subjective)

Interactions that refer to 'I' and 'you'



Example:

[1] I'm thinking we might want to have hamburgers for dinner.

[2] Well... You've had them a lot lately. What about chicken instead?

[3] Chicken is fine too.

[4] We don't have any chicken defrosted.

[5] You could go to that takeout place and bring it back.

[6] I went last time, so it's your turn.

[7] I've been much more often!

[8] Yes, ok, I'll go after I finish reading my email.

[9] Ok.

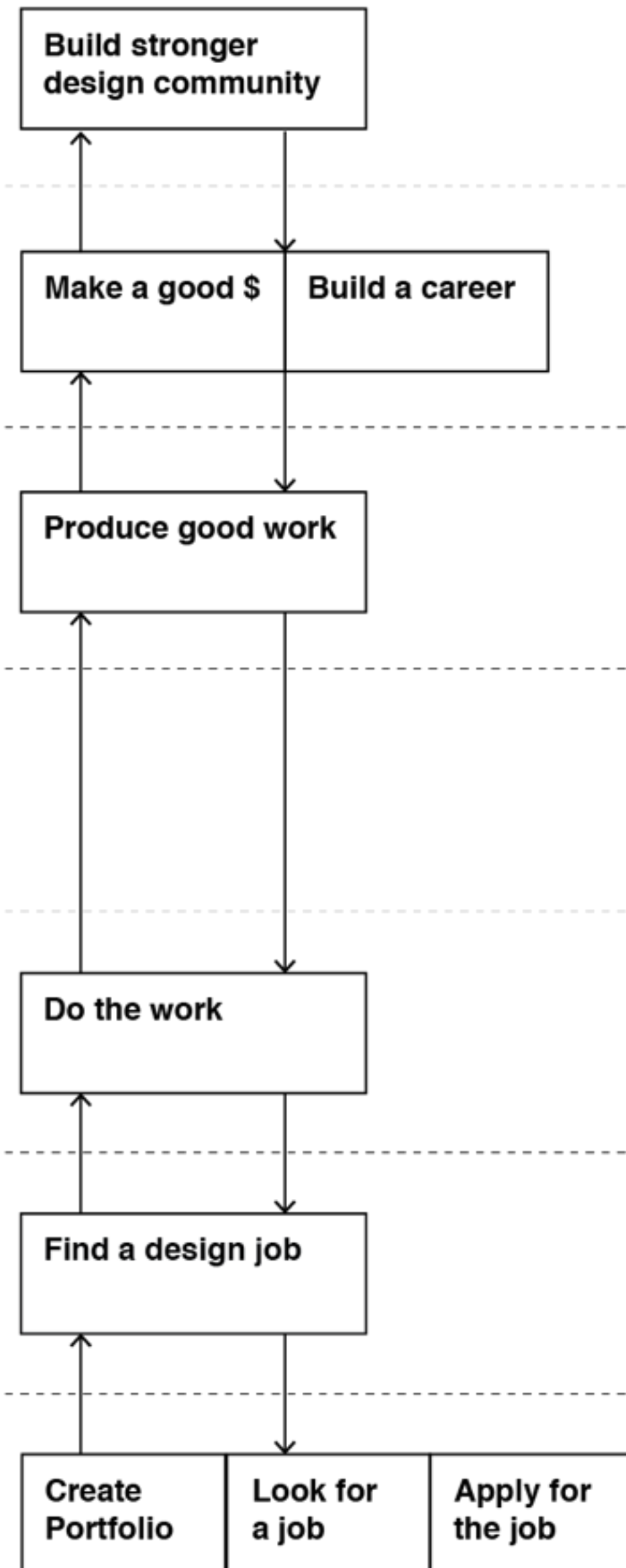
A group of people, including a man and several women, are gathered around a large table in a meeting room. They are looking at a large sheet of paper on the table, which appears to be a design or project plan. The man in the center is speaking and gesturing with his hands. The women are listening attentively, some holding notebooks. The room has whiteboards and a window in the background.

PROBLEM STATEMENT

In India, there are many talented designers, but it is challenging to finding connections to other designers and design jobs.

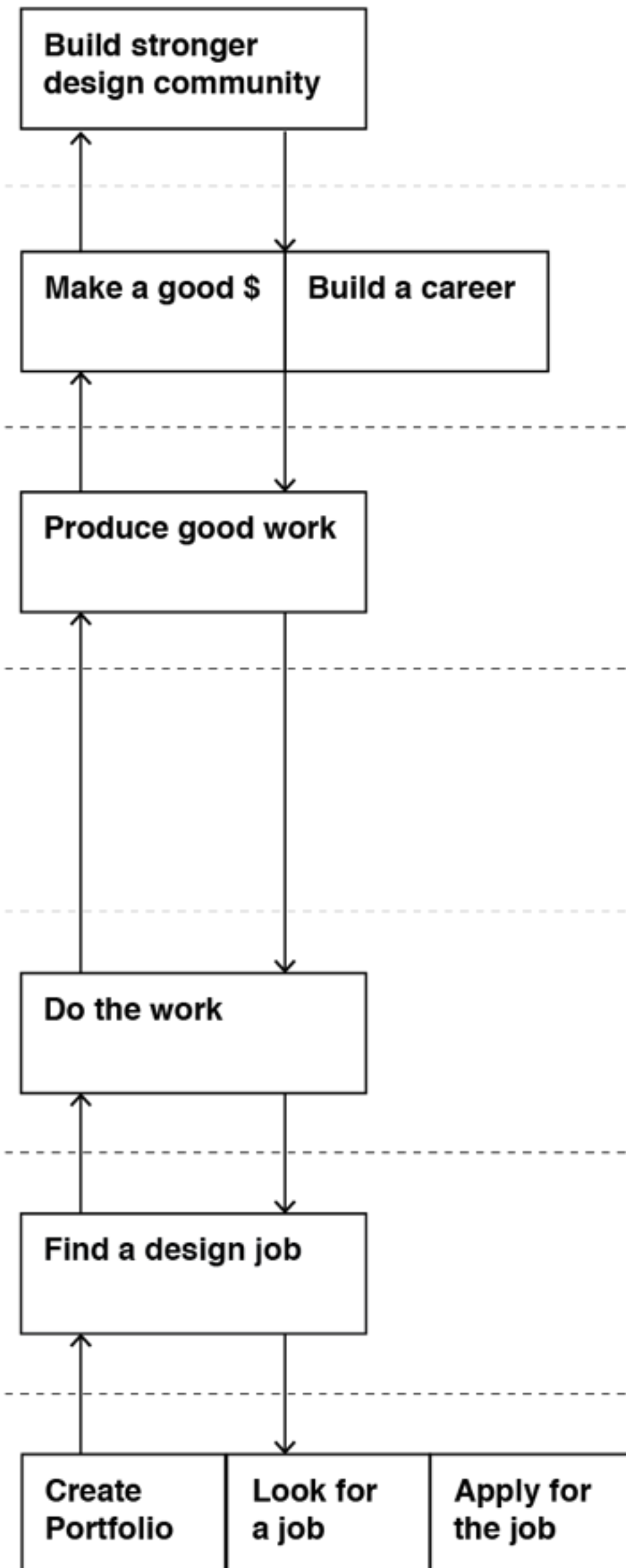
DESIGNERS

DESIGNERS IN INDIA

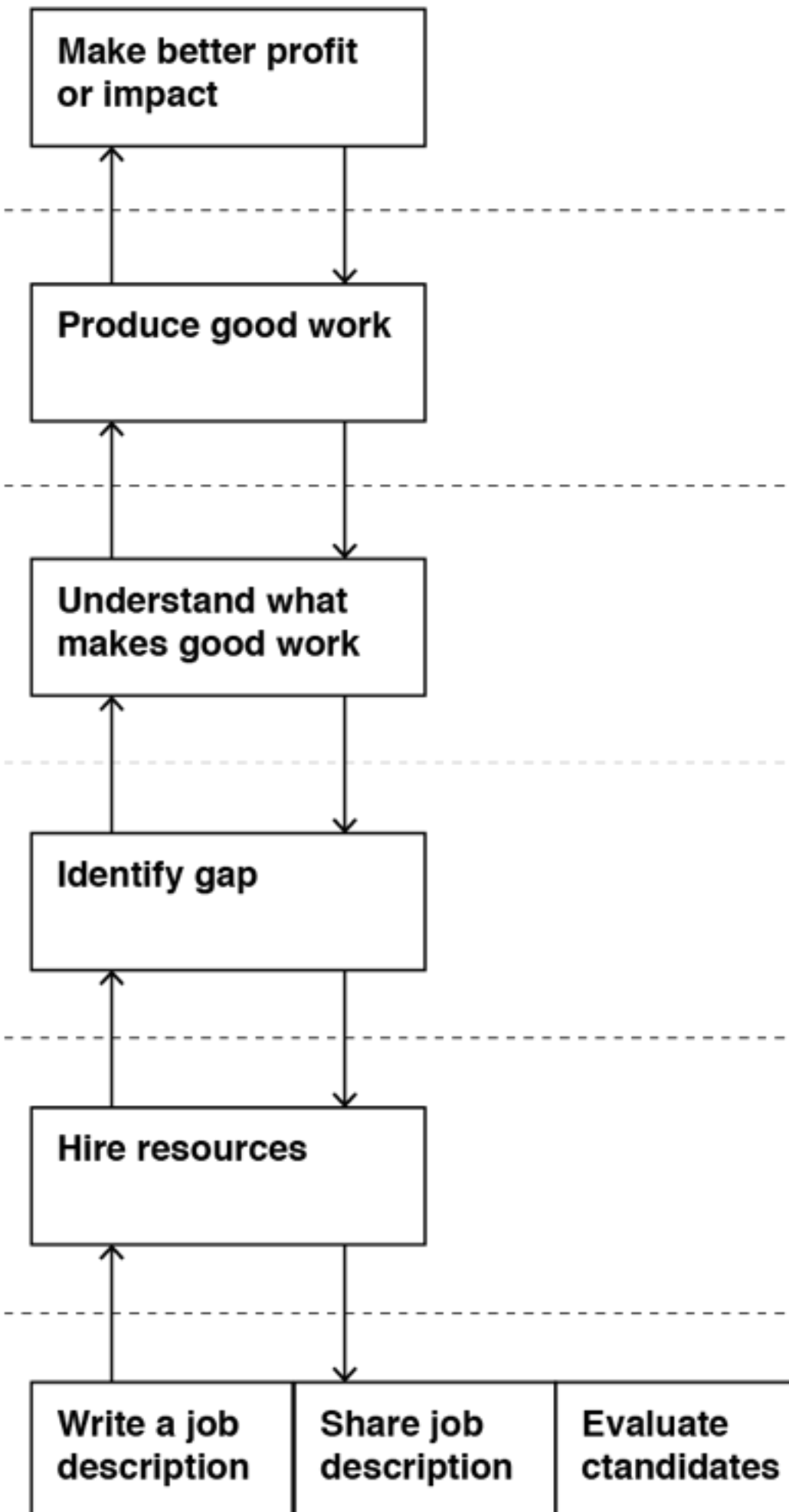


DESIGNERS AND COMPANIES

DESIGNERS IN INDIA

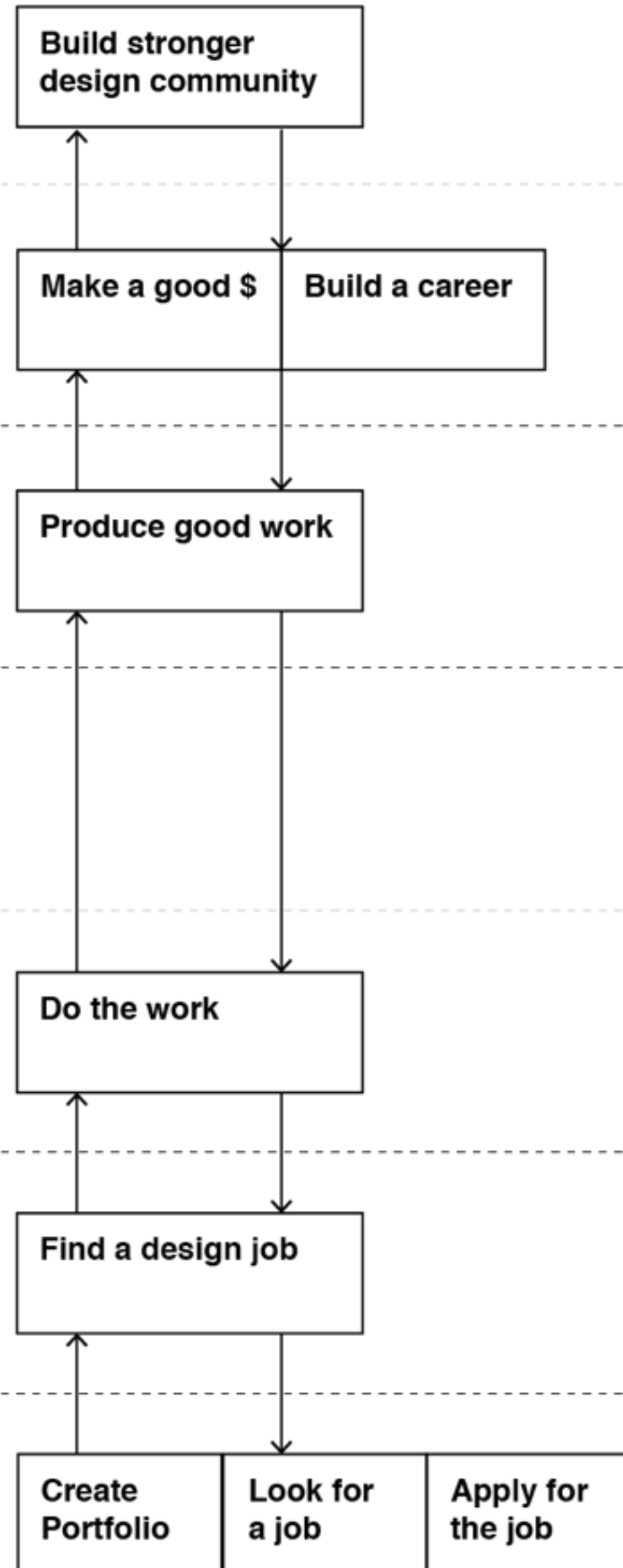


COMPANIES

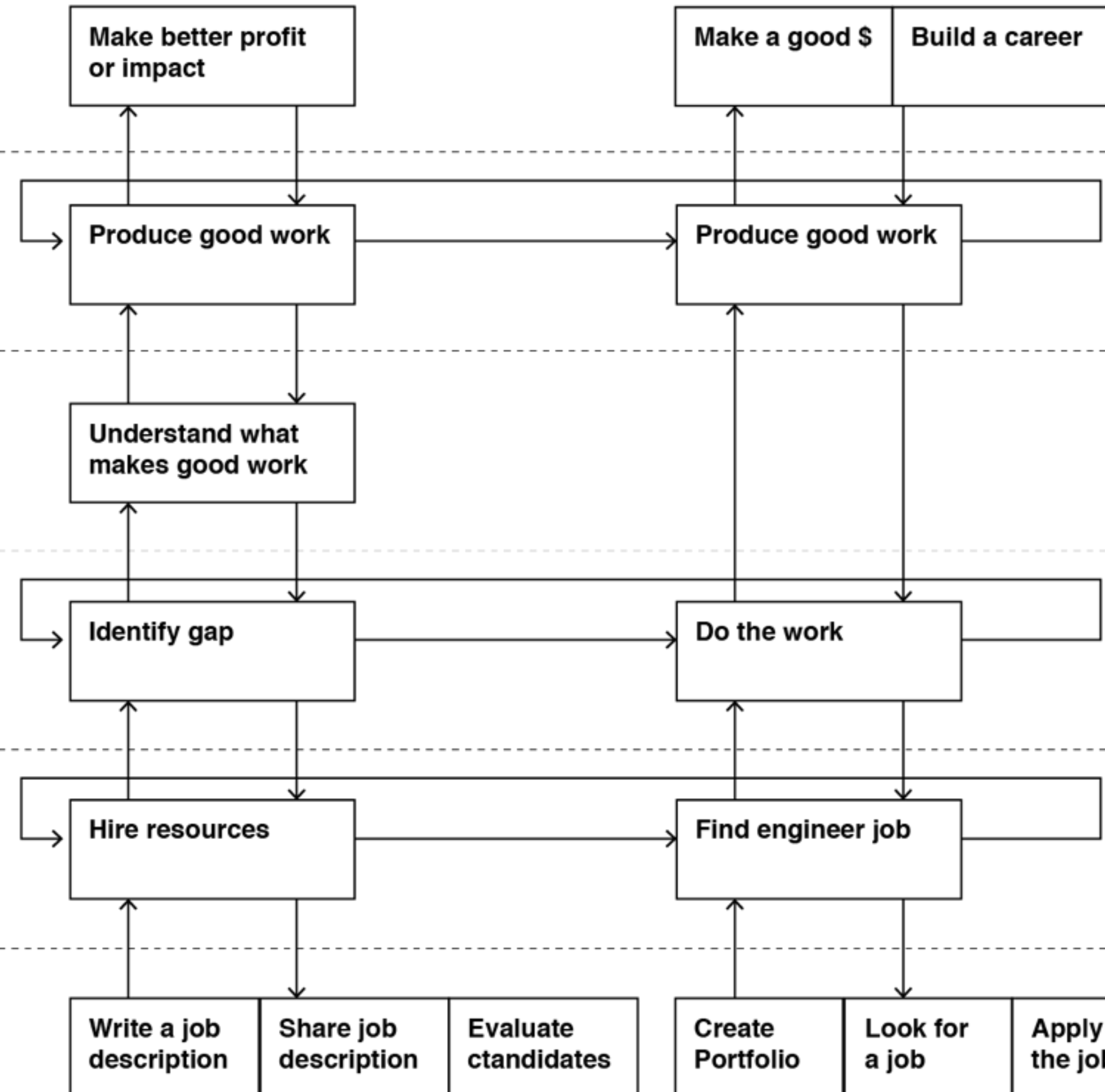


CURRENT CONVERSATION

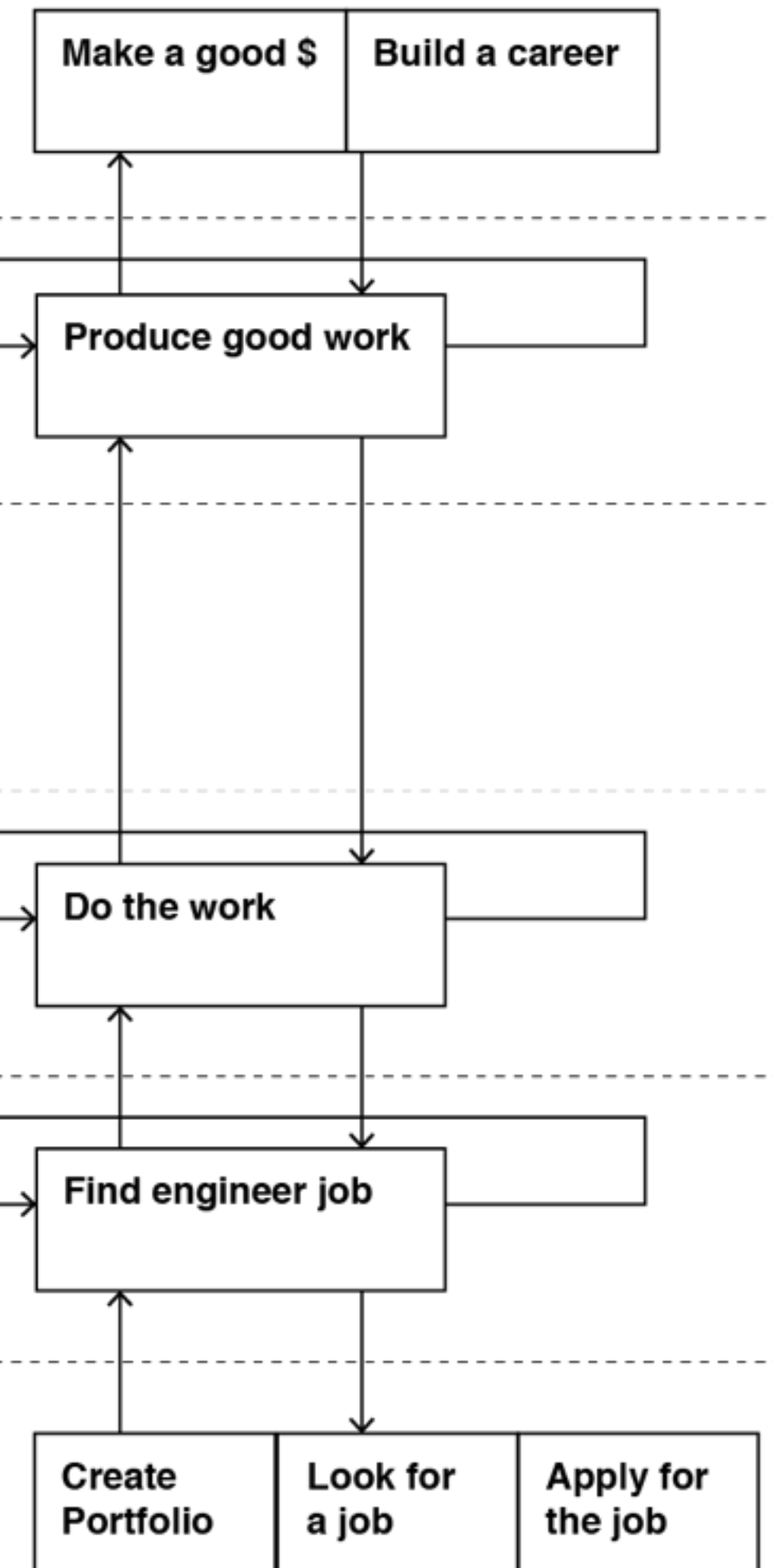
DESIGNERS IN INDIA



COMPANIES

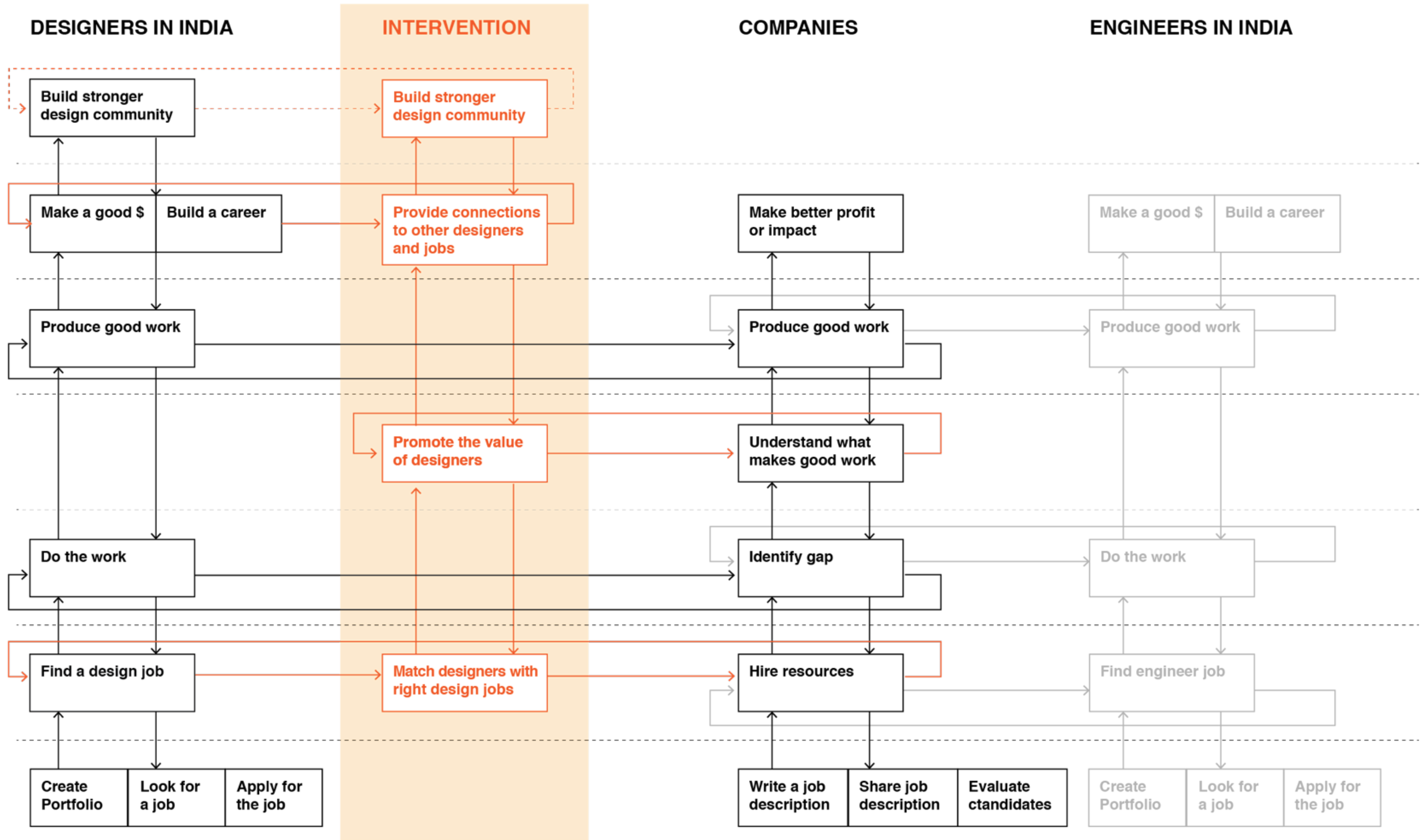


ENGINEERS IN INDIA

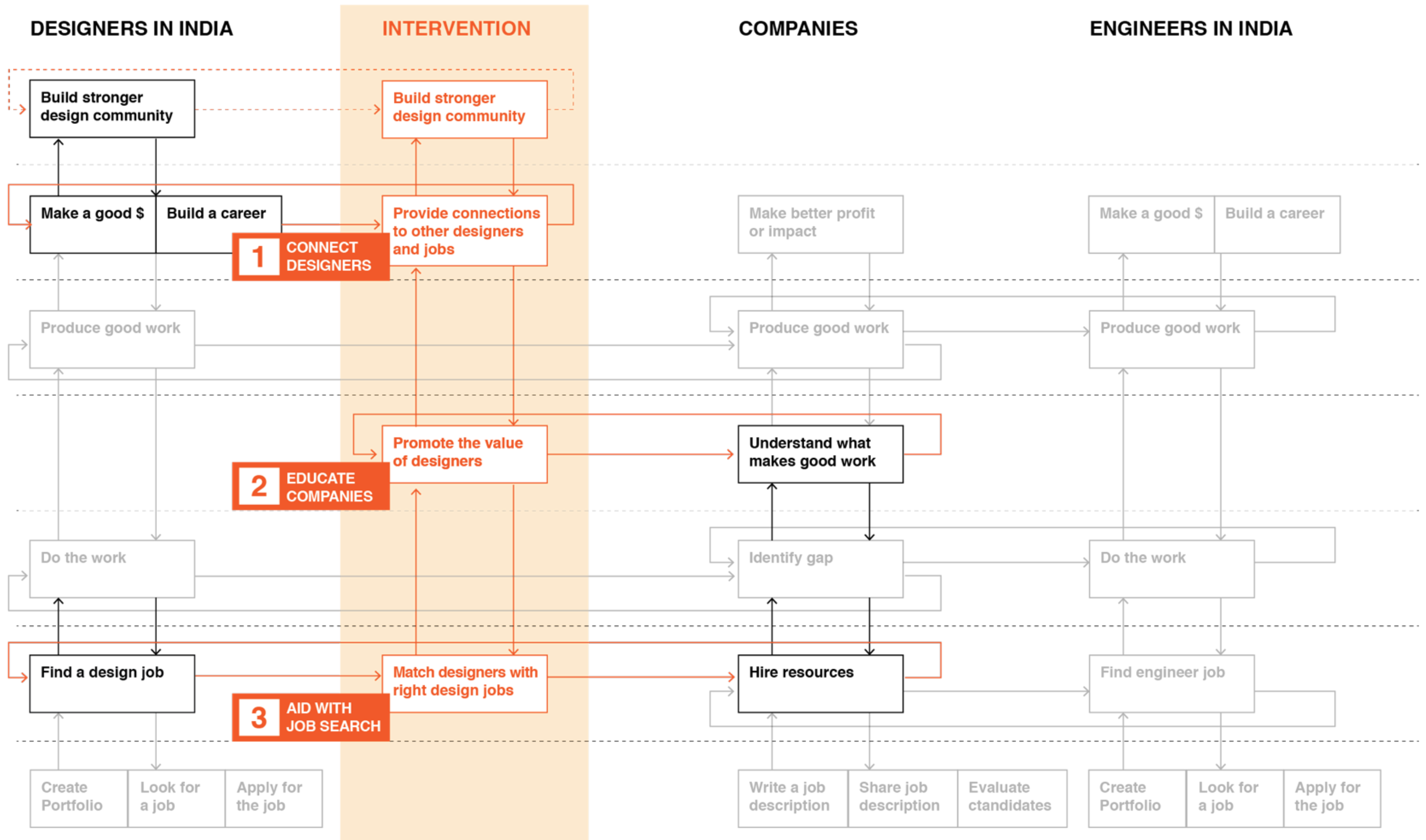


NO CONVERSATION OR VERY LITTLE CONVERSATION

INTERVENTION TO INCLUDE DESIGNERS



INTERVENTION TO INCLUDE DESIGNERS



Conversation (Subjective Interactions)

Summary of Elements

A: “Controlling Process (alias goal)”
is, for example, management policy defined at this level (“increase revenue by 4%”) but carried out at another (see below). The distinction of levels is made in the course of the modeling process. The precise levels are chosen to display the flows of control and feedback that are of interest.

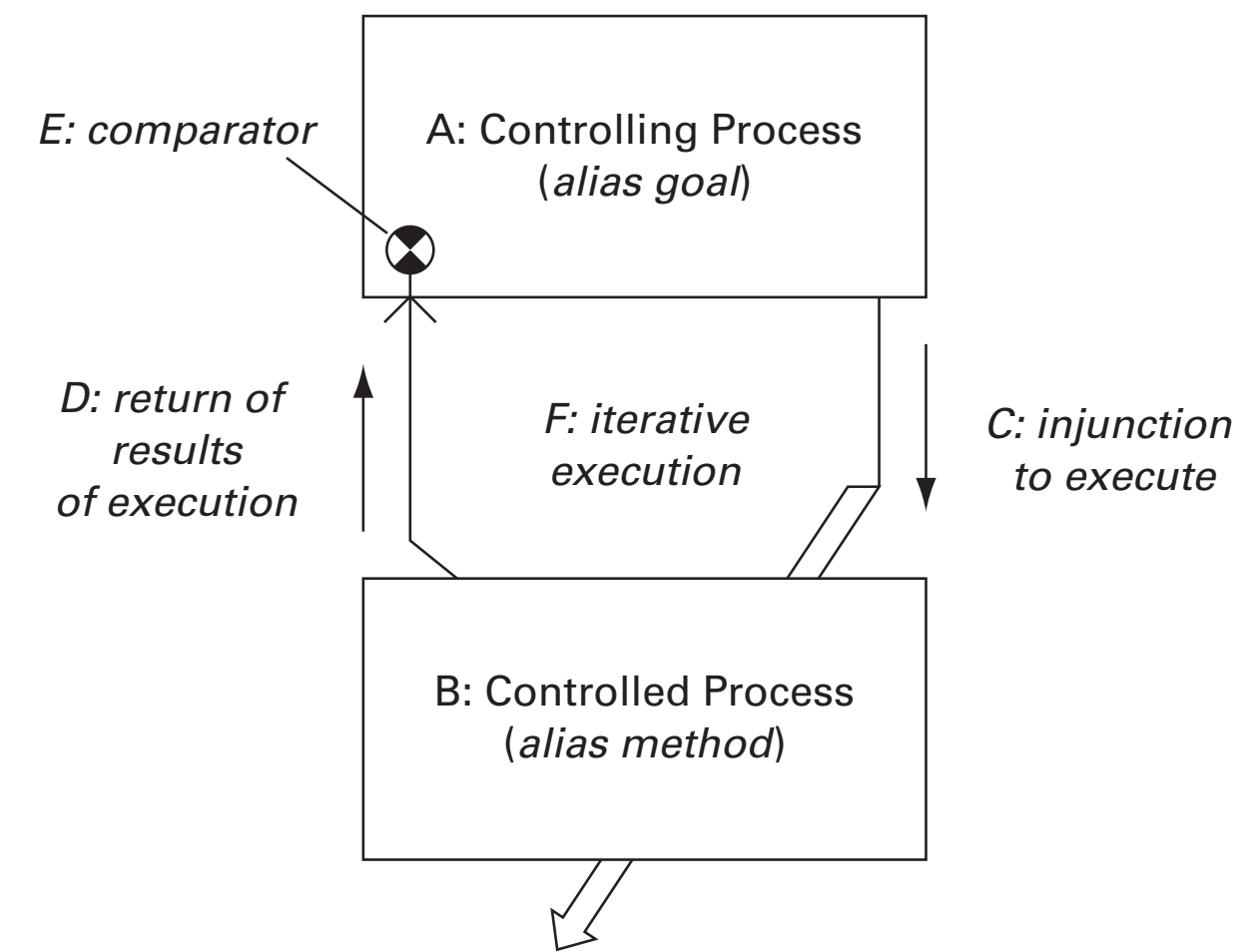
B: “Controlled Process (alias method)”
is, for example, the increase of revenue via hiring more salespersons, as dictated by the level above.

C: “Injunction to execute” is the actual line of control that causes the lower level to respond, for example, the memorandum indicating start of a project or a budget authorization.

D: “Return of results of execution”
is the actual feedback of information to the higher level, as for example a report indicating results of specific manufacturing procedures, or an internal survey.

E: “Comparator”
is the specific mechanism whereby the feedback information is used by comparing the actual result to the desired result, or original goal.

F: “Iterative execution”
of the entire loop takes into account the result from the comparator above, that causes changes in various processes, flows of control and feedback, etc., to make the entire loop more effective.



Closure occurs when comparator confirms execution of controlled processes is coherent with controlling processes (as when a goal is achieved by executing a successful method)

If all of the above aspects are present, the system of interactions is deemed “intelligent.”

It must be emphasized that the two levels shown are only two of (possibly) many vertical levels; modeling by the observer leads to distinguishing multiple vertical layers in the conversation. Hence a box that appears at a “lower level” in one interaction may itself be at the “higher level” relative to a further box that appears below it.

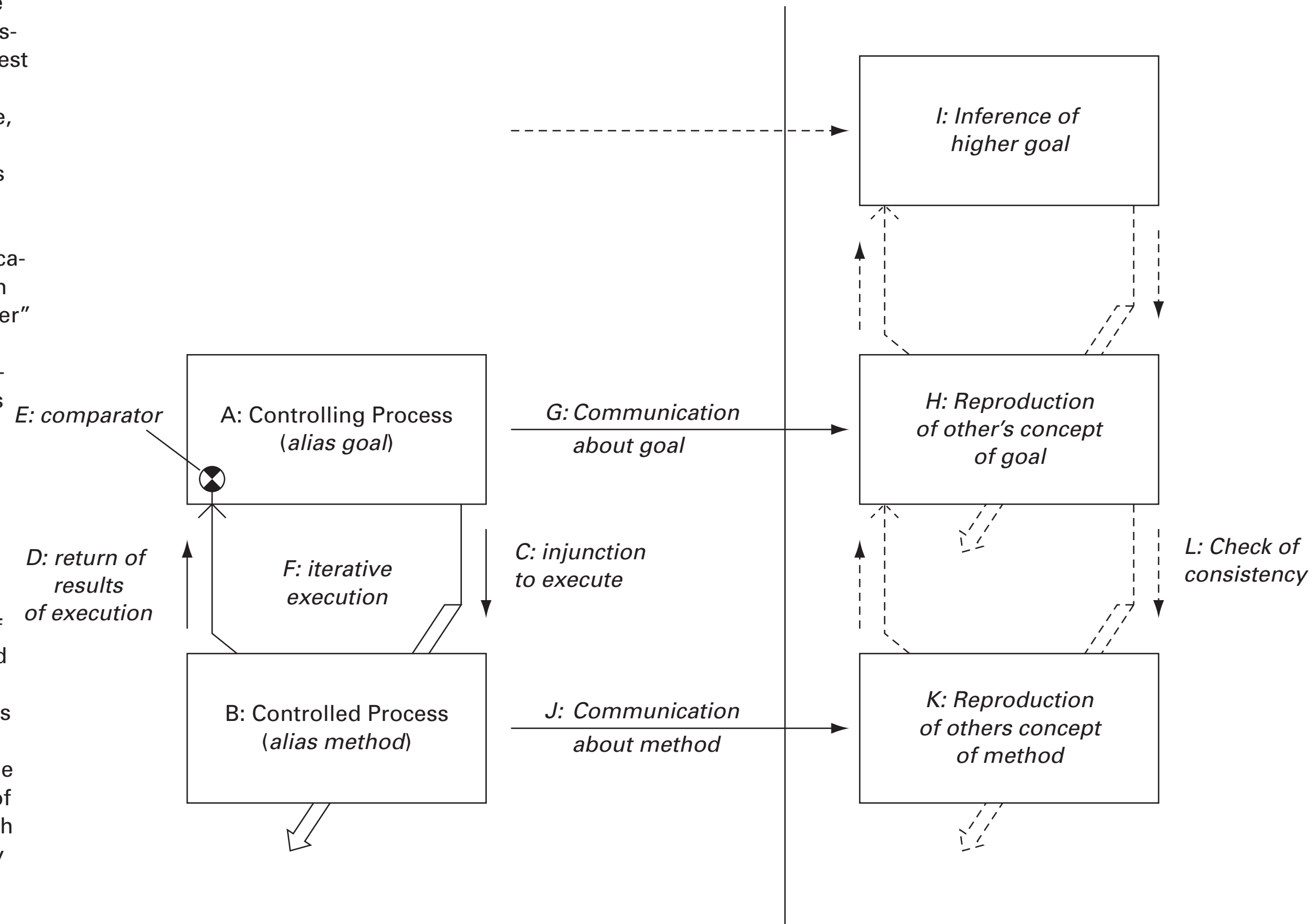
Conversation (Subjective Interactions)

Summary of Elements

G: "Communication about goal"
is, for example, the communication to a customer that the company's value proposition expressed via its advertising is to provide products with the best cost/benefit ratio, or durability, for a given application; or, to an employee, that the company considers the employee to be an essential asset for its future.

H: The actual result of the communication is different than what came from the "sender." ("Sender" and "receiver" are held in quotations to retain a different meaning from that of information theory.) The "receiver" attempts "Reproduction of other's concept of goal" but this may not be accurately achieved.

I: "Inference of higher goal"
is the production of a higher goal for which the previous interaction is consistent and affirming. This is as if the "sender" had actually exchanged something (shown as the upper, dashed arrow) but in fact nothing has actually been "transferred" at this level, up to this point. Quite often, the context or the common experience of the two conversants provides enough for a higher-level goal to be correctly inferred. However, sometimes the "sender" creates a false context to encourage an incorrect inference, as for example when advertisers imply a food product is healthy simply because it uses the word "natural", or when a participant simply states "I have your interests at heart" while not having demonstrated this to be the case.



J: "Communication about method"
is, for example, the communication to a customer about the details of a product's capabilities (which should affirm its stated goals, G); or, an exchange with an employee about the details of working conditions and health benefits from the corporation, which should show the method by which that employee is to be considered an asset to the corporation, relative to the goal as communicated in G.

K: "Reproduction of other's concept of method", as in H above, is subject to interpretation and later modification.

L: "Check of consistency"
is a reproduction in the "receiver" of the entire vertical loop of the "sender". This may show the consistency across the upper and lower levels, and thereby affirm understanding of the "sender's message." Of course, this can only be (at best) very close and (at worst) only a small fraction of the intended message. Alternatively, the consistency check can expose the inconsistency between communicated goal and method. For example, the loss of retirement pensions or erosion of healthcare coverage would contradict the assertion that the employee is a valued asset to the corporation. The "receiver" can either make queries back to the "sender" about intended meanings in order to clarify understanding (not shown in the diagram); or maintain a model of the perceived inconsistency in the "sender."

Paul Pangaro
pangaro.com/hciiseminar2019/
ppangaro@cmu.edu