Models for Innovation and Interaction

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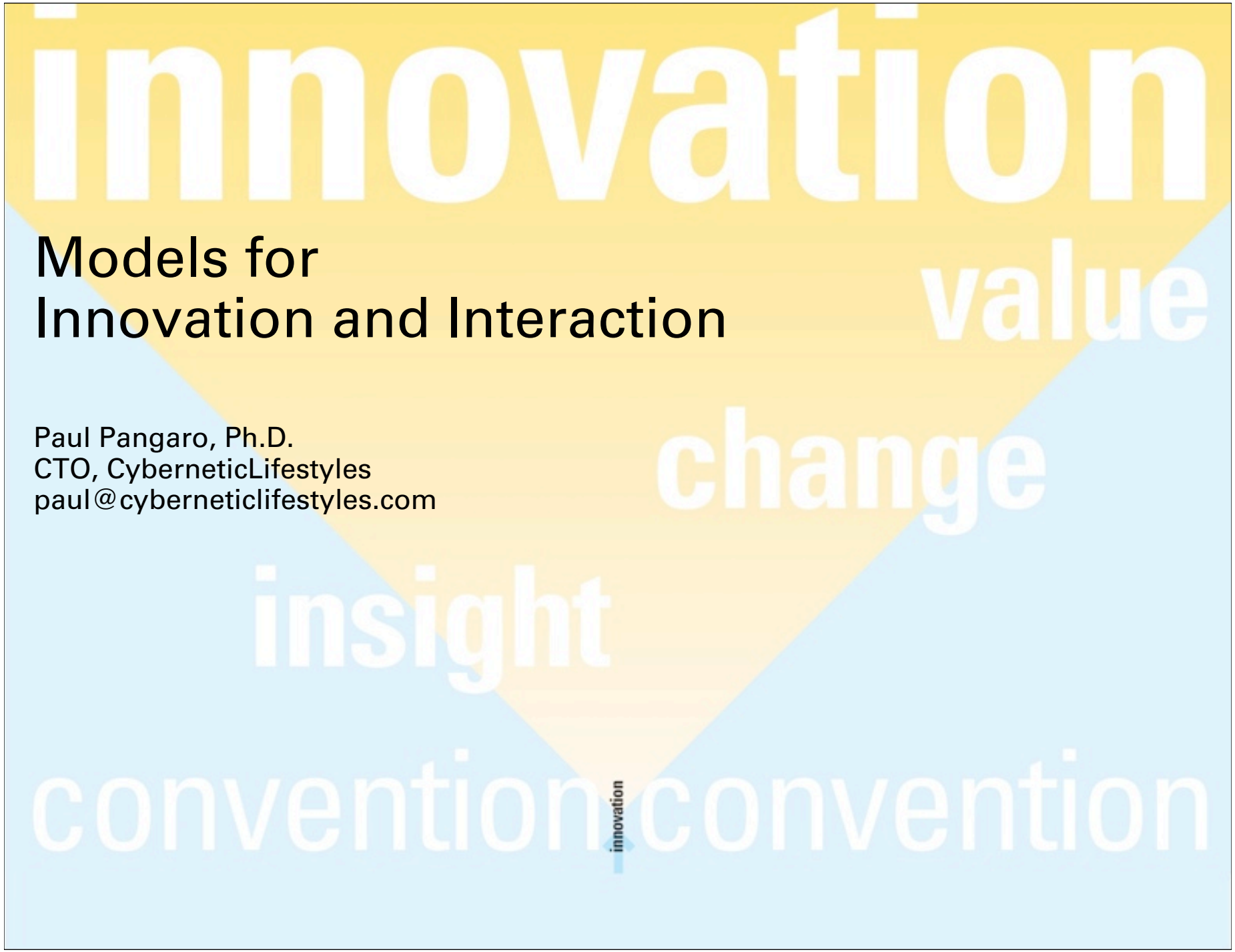
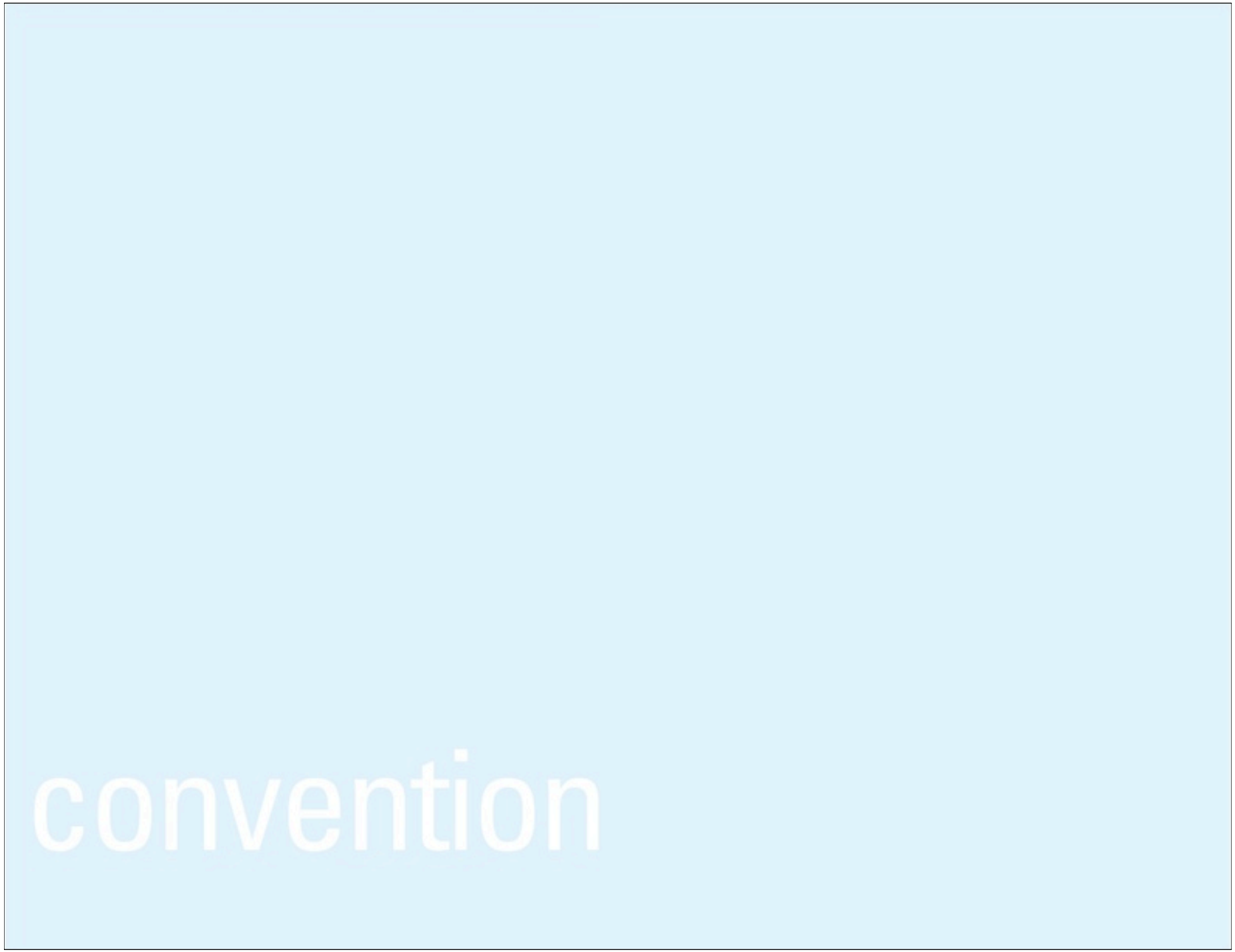
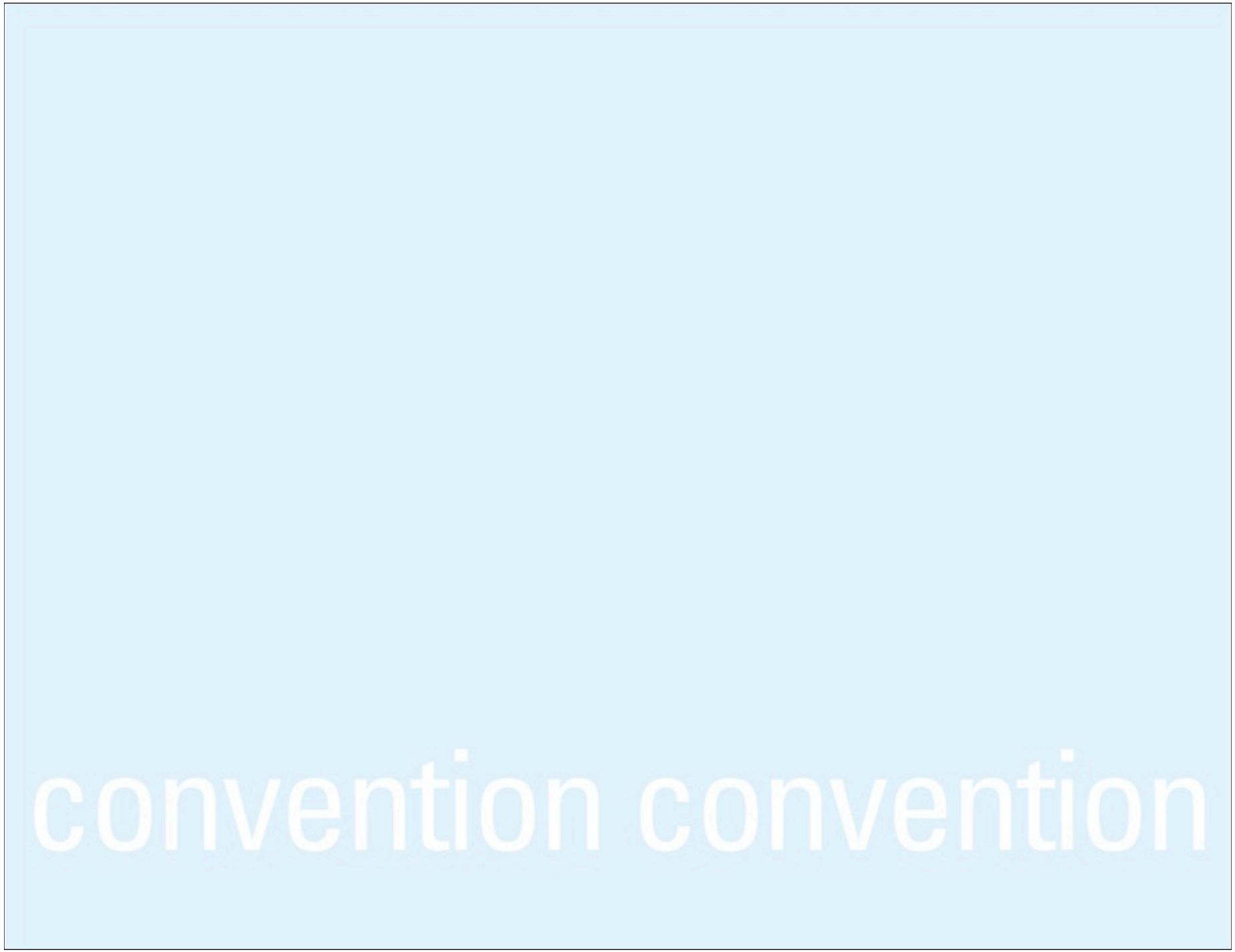



convention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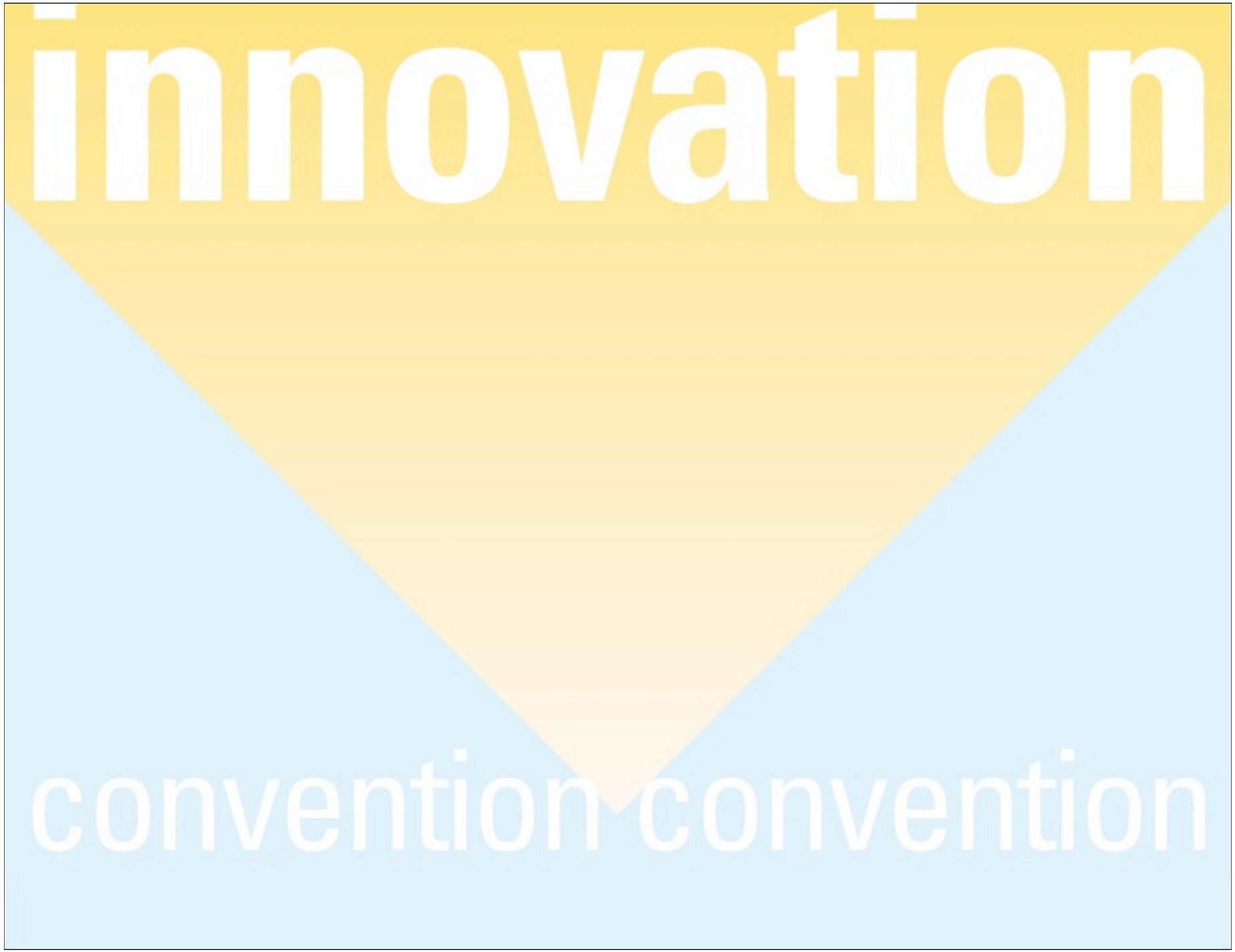
innovation
convention convention

innovation

innovation requires **preparation**

innovation requires **preparation**
(immersion)

(a bit of luck)

innovation requires **preparation**

(immersion)

(a bit of luck)

preparation aids **insight** (seeing opportunity)

(immersion)

ity) comes from **individuals**


community1
may fail to recognize
pressure (external)
decay (internal)
convention1
each faces
change (disturbance)
context1
(environment)
misfit (pain)
variety
(experiences)
recognition (definition)
(a bit of luck)
innovation
requires
preparation
(immersion)
aids
insight (seeing opportunity)
comes from
individuals
drive
articulation (prototyping)
community2
evaluates
demonstration (testing)
beliefs
may lead to
convention2
creates new
adoption (counter-change)
leads to new
actions
may lead to
artifacts
context2
fit (gain)
is reflected as increased
value
innovation
insight
change
value
convention
convention

convention 1

CONVENTION

community[1]

agrees on & is shaped by

convention[1]

consensus

community$_1$

agrees on & is shaped by

convention$_1$

maintains relationship to

context$_1$

(environment)

community$_1$

agrees on & is shaped by

convention$_1$

maintains relationship to

context$_1$

(environment)

may fail to recognize

pose long-term threats to any

pressure (external)

decay (internal)

community1
may fail to recognize
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pose long-term threats to any
inevitably lead to
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pose long-term threats to any
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each faces
change (disturbance)
is imbalance in relations among
maintains relationship to
disturbs relations creating
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(environment)
misfit (pain)

ped by

convention $_1$

maintains relationship to

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is imbalance in relations among

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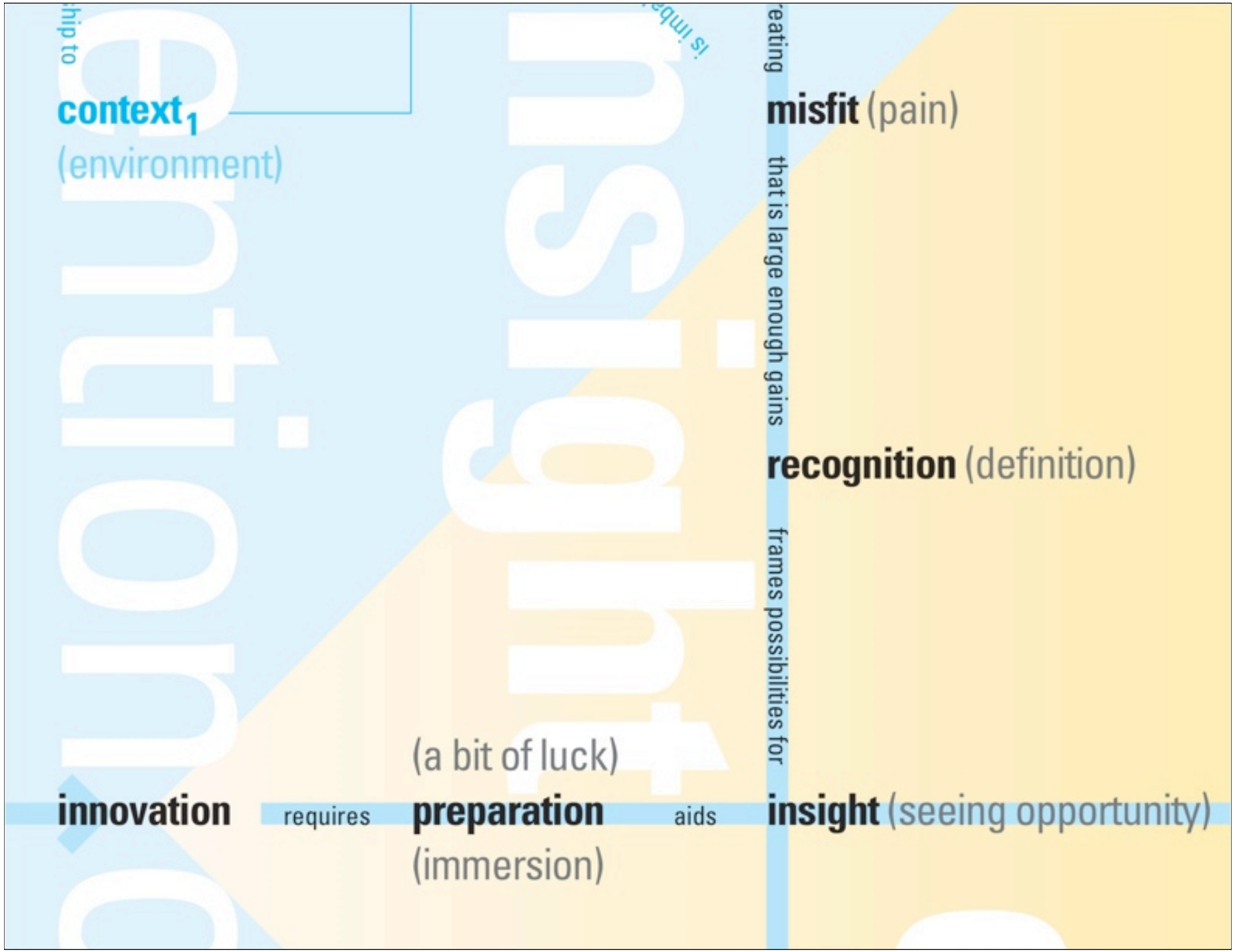
change (disturbs relations creating **misfit** (that is large enough gains **recognition** (frames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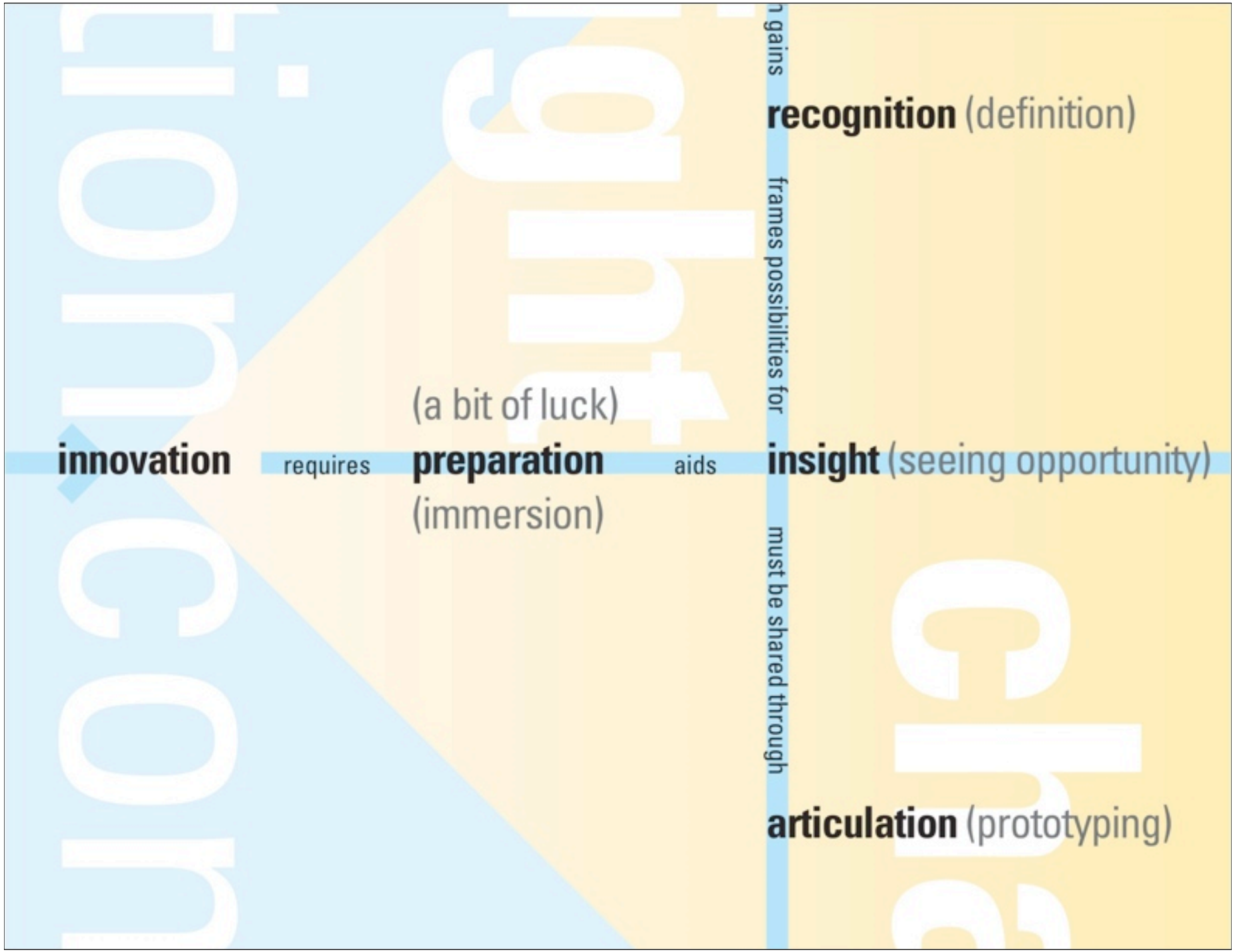
gains
recognition (definition)
frames possibilities for
(a bit of luck)
innovation
requires
preparation
(immersion)
aids
insight (seeing opportunity)
must be shared through
articulation (prototyping)

innovation requires (a bit of luck) **preparation** (immersion) aids

insight (seeing opportunity)

s for must be shared through

articulation (prototyping)

must be proved through

demonstration (testing)

rough

demonstration (testing)

reduces risk, encouraging

adoption (counter-change)

demonstration (testing)

rough reduces risk, encouraging

adoption (counter-change)

reforms relations creating

fit (gain)


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reduces risk, encouraging

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demonstration (testing)

reduces risk, encouraging

adoption (counter-change) leads to new **actions**

reforms relations creating

fit (gain)

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demonstration (testing)

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adoption (counter-change)

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fit (gain)

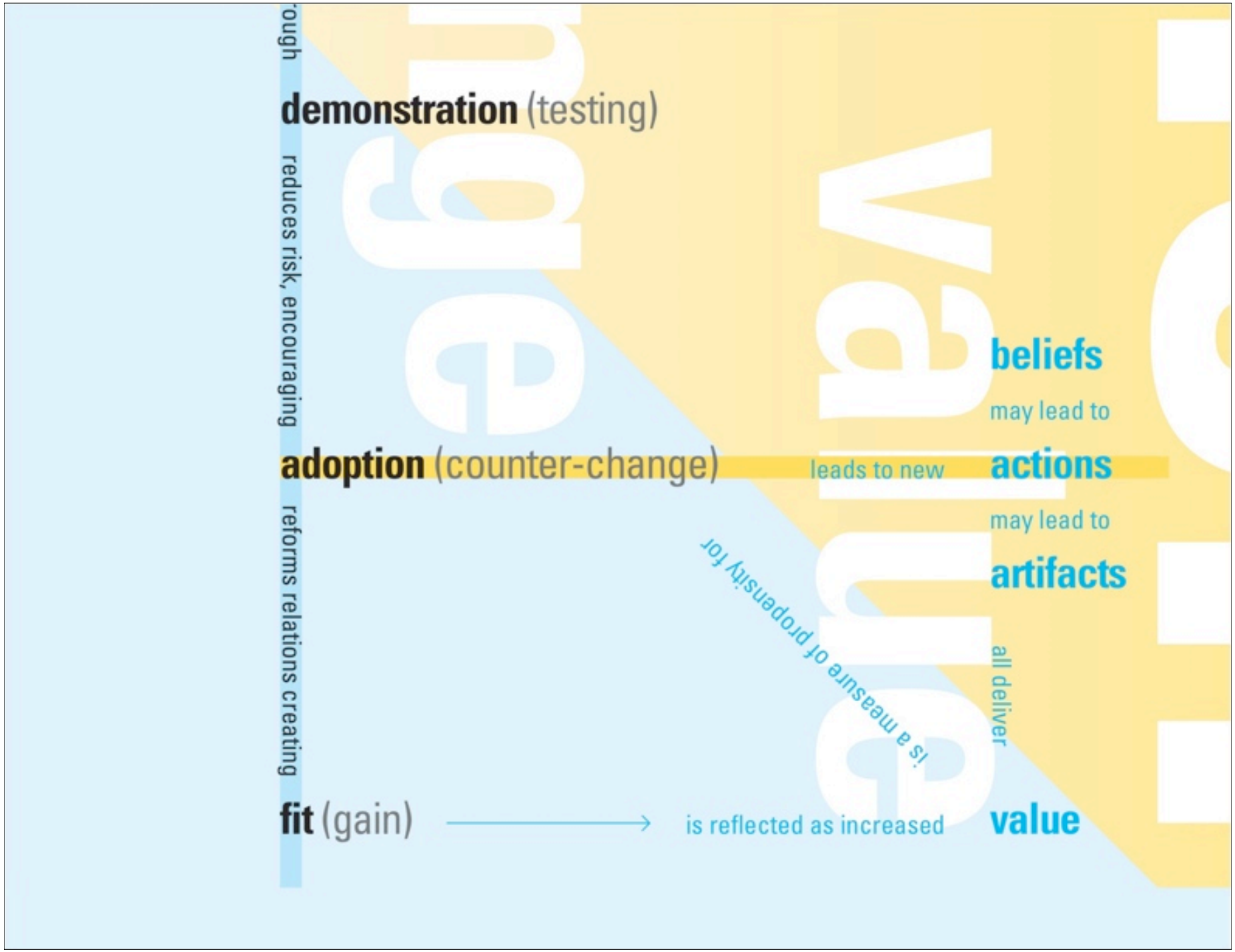
beliefs

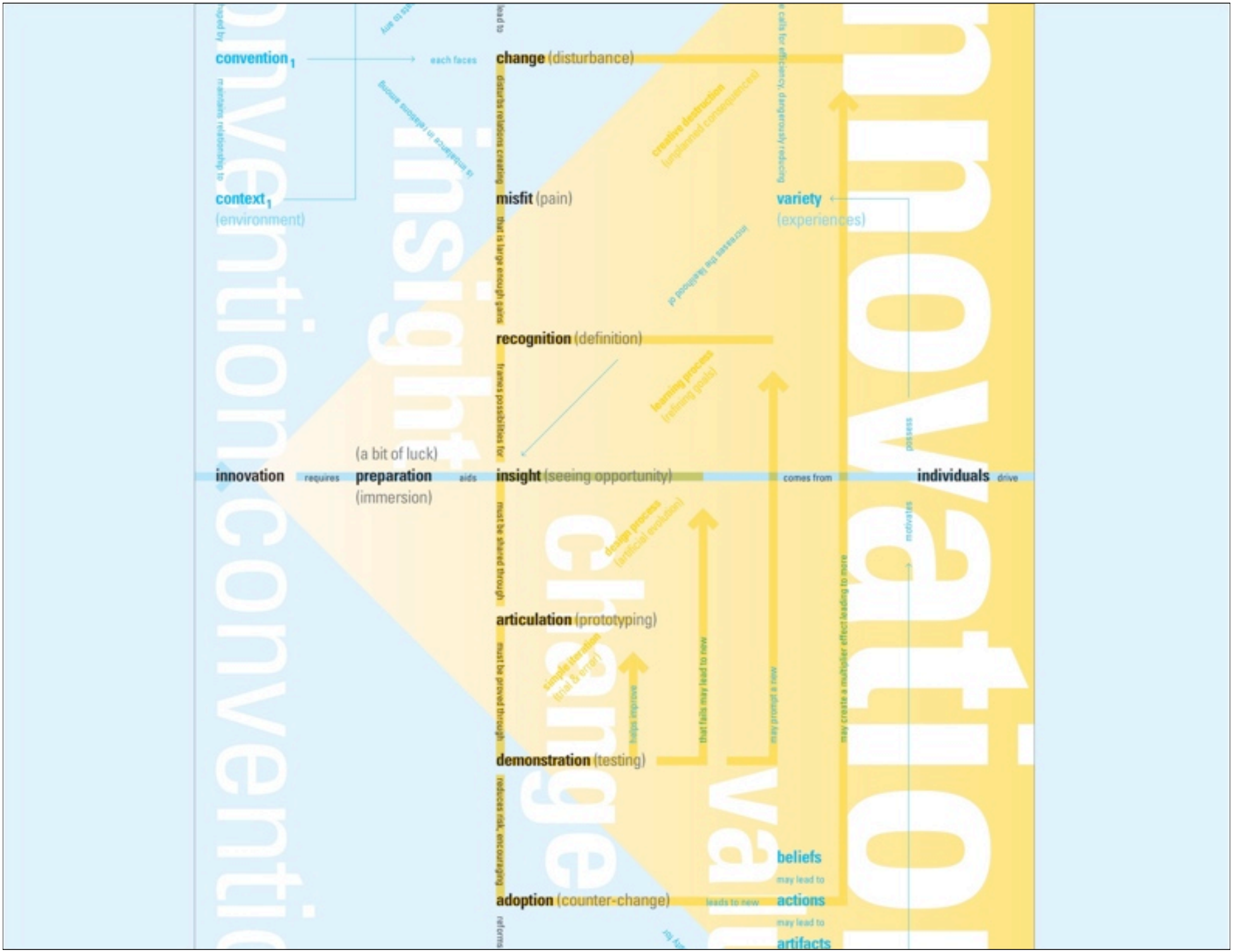
may lead to

leads to new **actions**

may lead to

artifacts


ough
demonstration (testing)
reduces risk, encouraging
adoption (counter-change)
reforms relations creating
fit (gain)
leads to new
is reflected as increased
is a measure of propensity for
beliefs
may lead to
actions
may lead to
artifacts
all deliver
value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demonstration (testing)
adoption (counter-change)
variety
(experiences)
beliefs
may lead to
actions
may lead to
artifacts
creative destruction
(unplanned consequences)
learning process
(refining goals)
design process
(artificial evolution)
simple iteration
(trial & error)
helps improve
that fails may lead to new
may prompt a new
may create a multiplier effect leading to more
motivates
possess
leads to new
disturbs relations creating
that is large enough gains
frames possibilities for
must be shared through
must be proved through
reduces risk, encouraging
innovation
change
innovation


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a model of innovation
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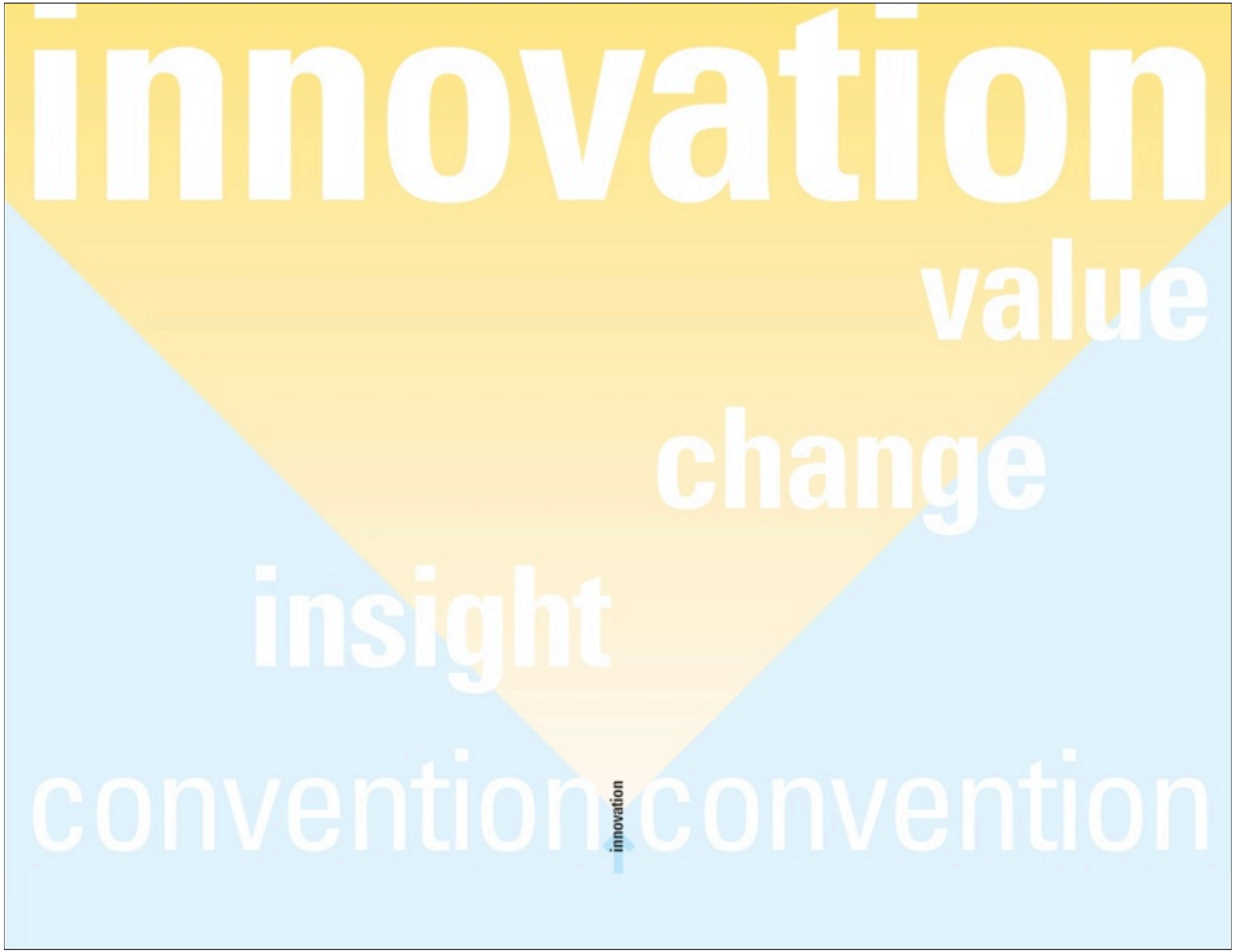
innovation
value
change
insight
convention
innovation
convention

a model of **innovation**

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ACAD

a model of interaction

participative systems

outline

i. present a hypothesis
ii. sketch a framework
iii. propose a research direction

I. present a hypothesis

participants in interaction

- act on their own
- behave in complex ways that make sense to us
- interact with us directly
- work with us in achieving our goals
- modify their own goals
- partner with us in the creation new goals

developing a model of interaction

to understand existing interactions with participants,
and to propose new and more interesting ones,
we need a framework to characterize:

- autonomy
- variety
- engagement
- collaboration
- goal-setting

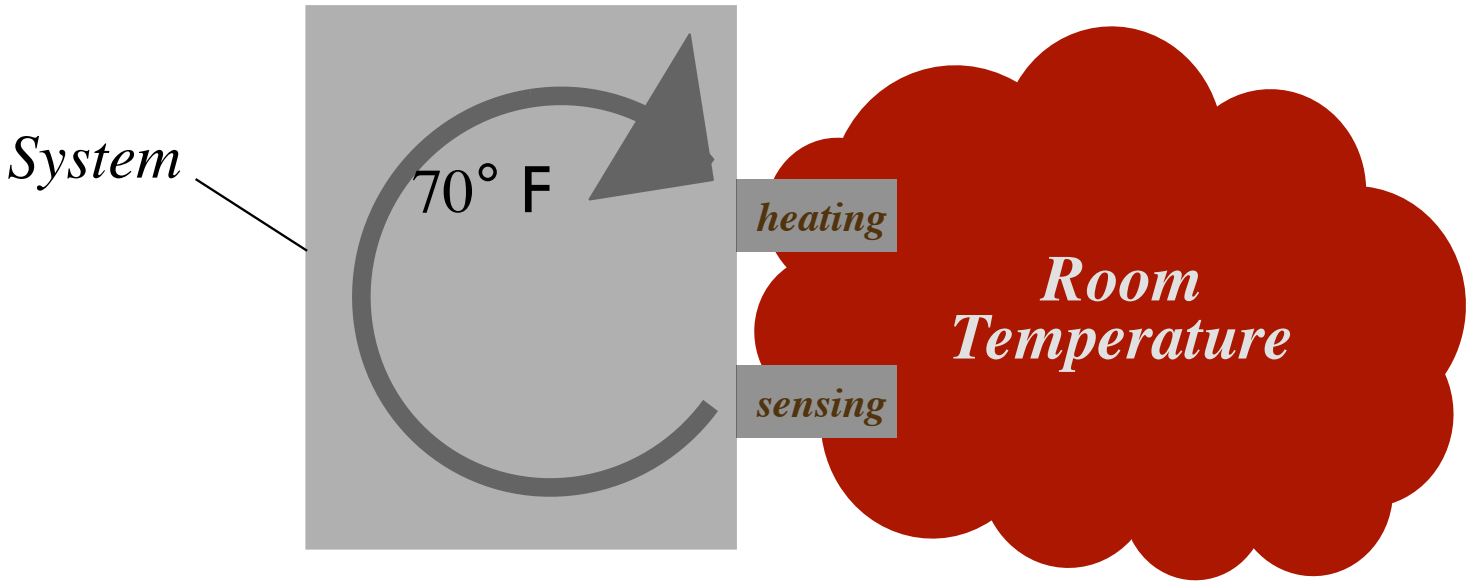
II. sketch a framework

- define an architecture of goals
- characterize “participative systems”
- compose systems of users and artifacts
- increase system variety

categorizing goals — single-loop system

detects and reacts

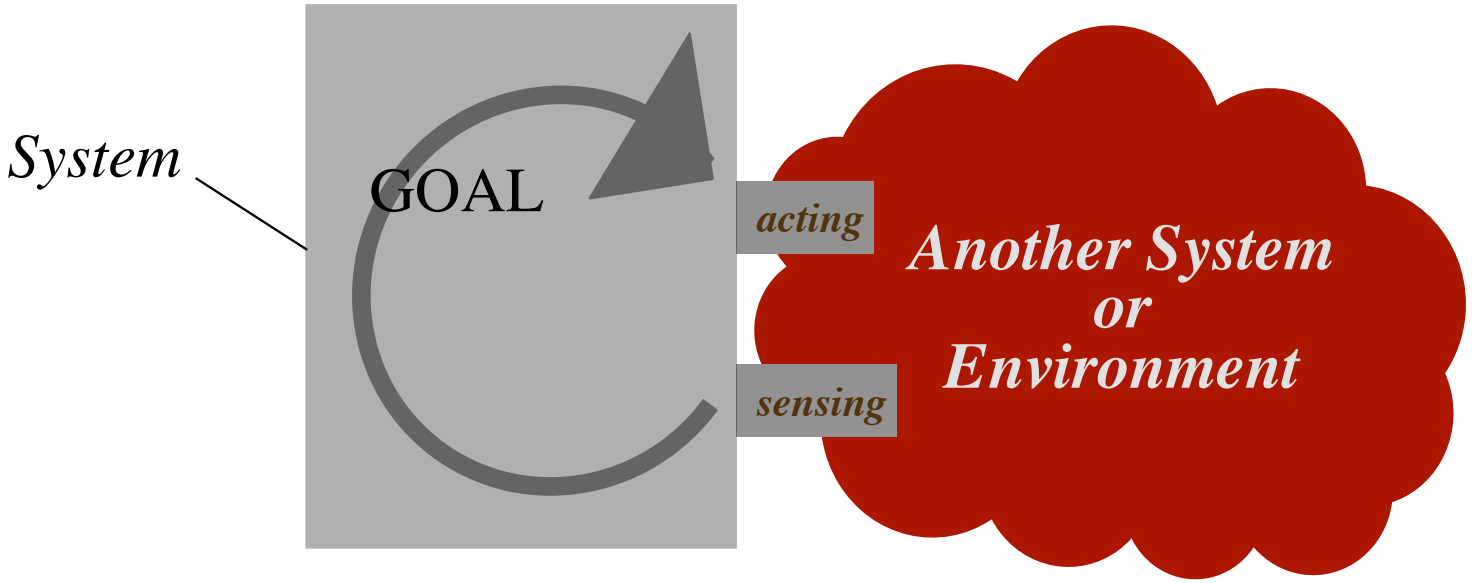
- thermostat senses temperature = 65°F
- compares to 70°F setpoint
- turns on heat



categorizing goals — single-loop system

detects and reacts

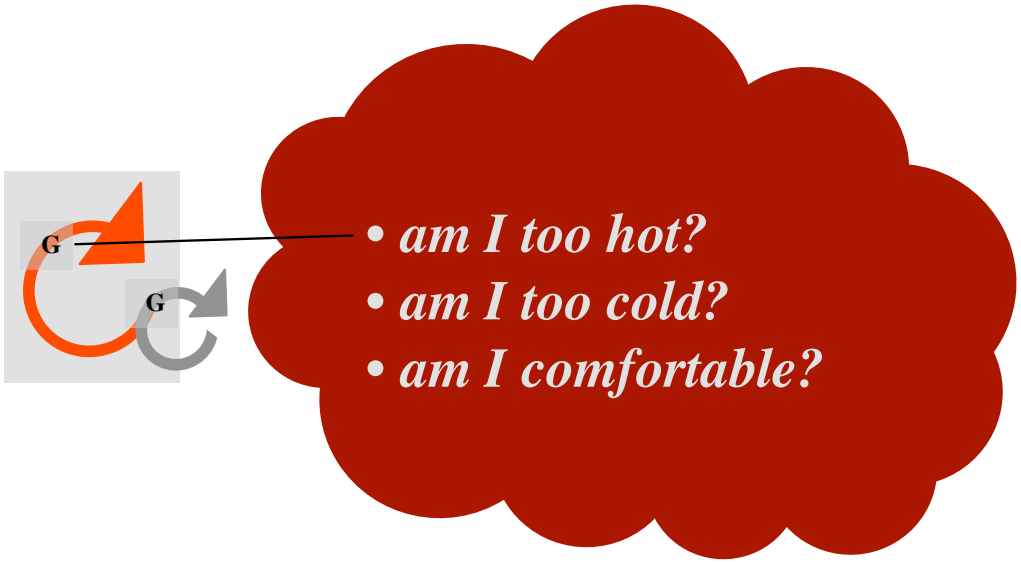
- sense current state
- compare to fixed goal
- act



categorizing goals — double-loop system

person resetting a thermostat

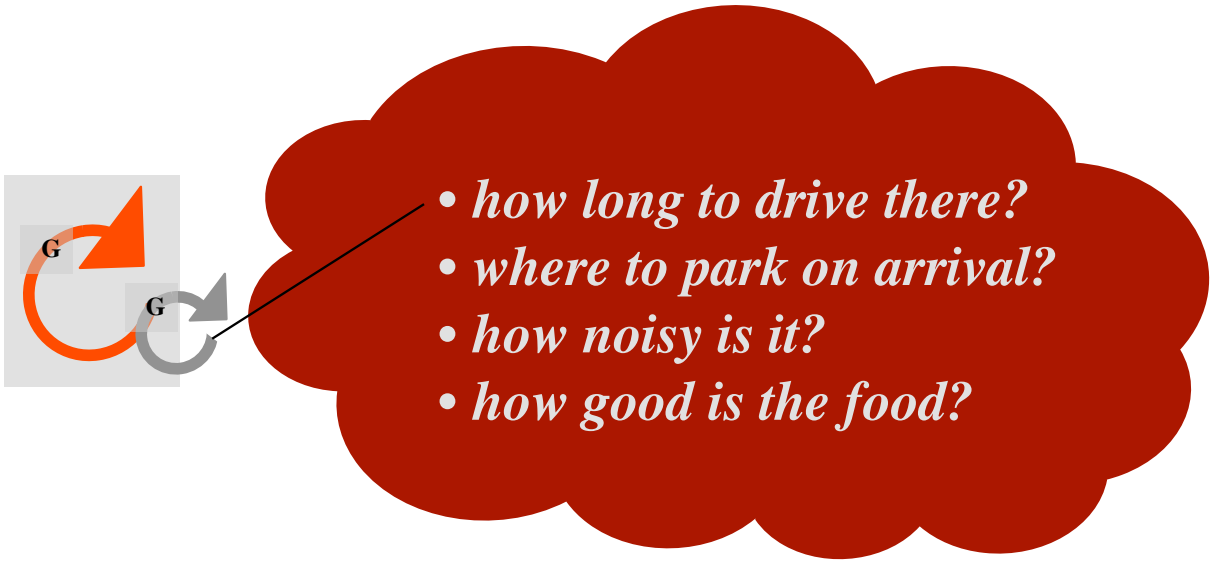
- wants to be comfortable—second-order goal
- ...by setting thermostat to 70°F—first-order goal
- ...in response to feeling hot, cold, etc.



categorizing goals — double-loop system

dinner with friends

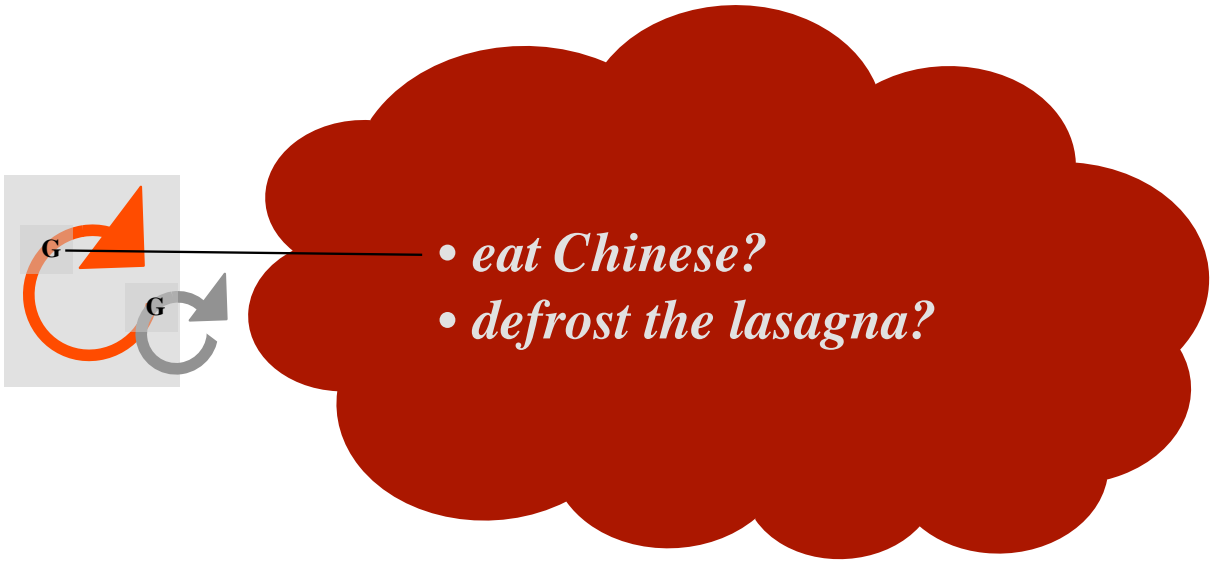
- wants to eat Italian food—second-order goal
- ...deciding which one—first-order goal
- ...in response to hassle factors of travel time, parking, etc.



categorizing goals — double-loop system

dinner with friends

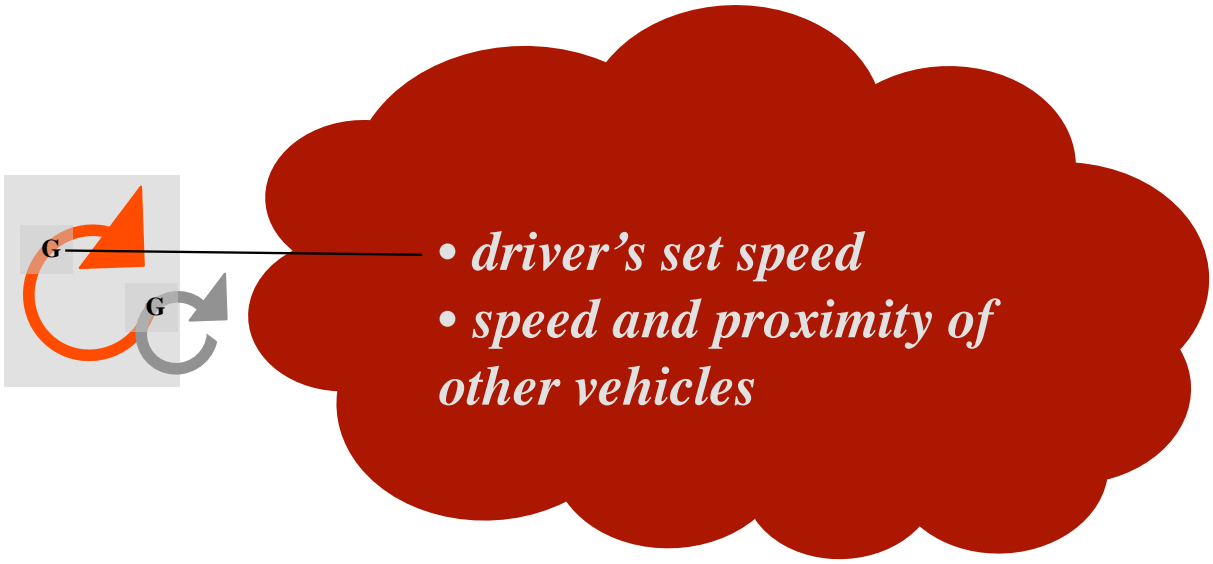
- wants to eat where??—second-order goal
- ...deciding which one—first-order goal
- ...in response to hassle factors of travel time, parking, etc.



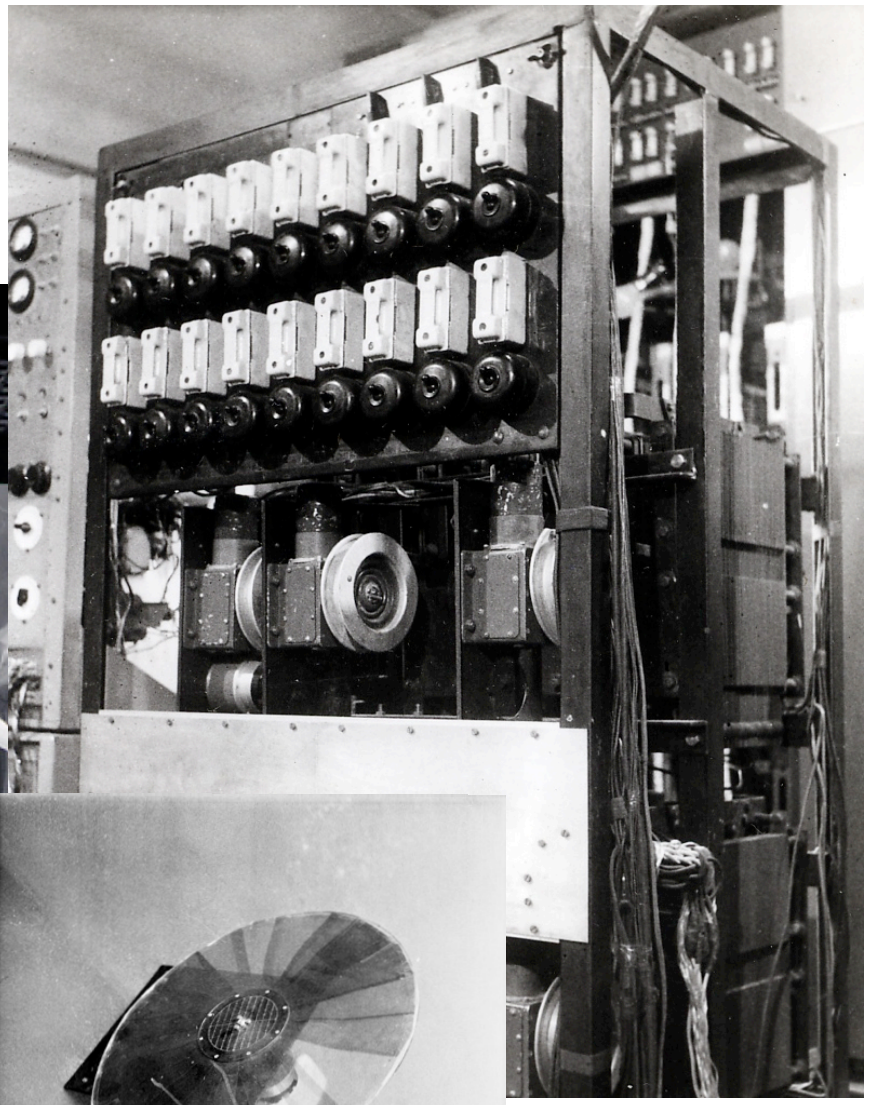
categorizing goals — double-loop system

adaptive cruise control

- avoid collisions with other vehicles—second-order goal
- ...by varying setpoint of cruising speed—first-order goal
- ...in response to changing speeds of vehicle in front



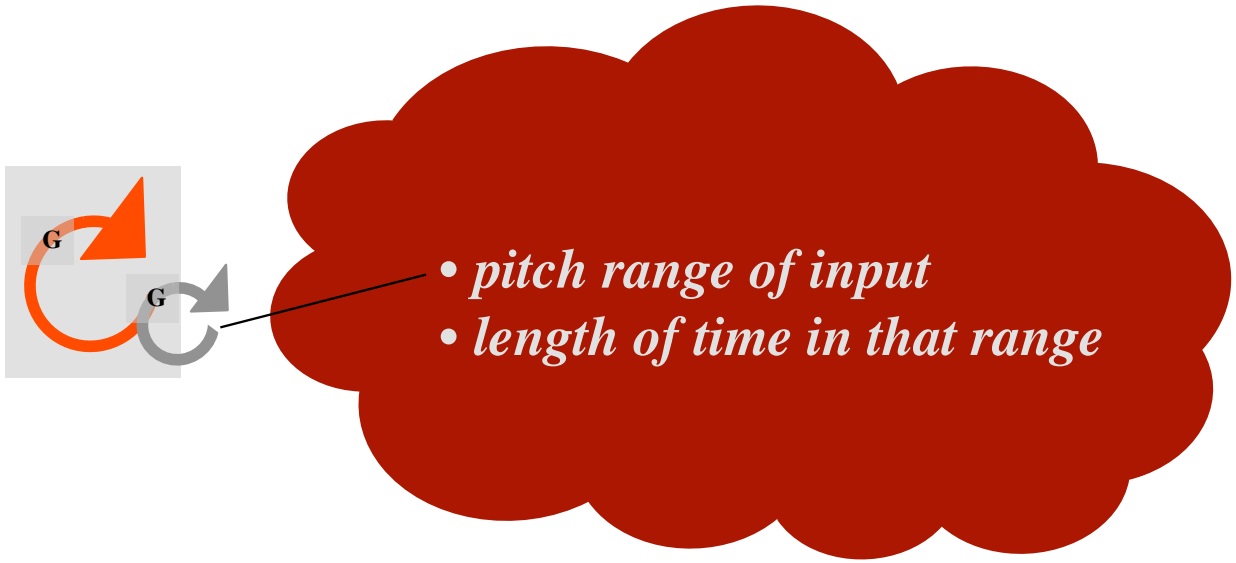
Gordon Pask's Musicolour



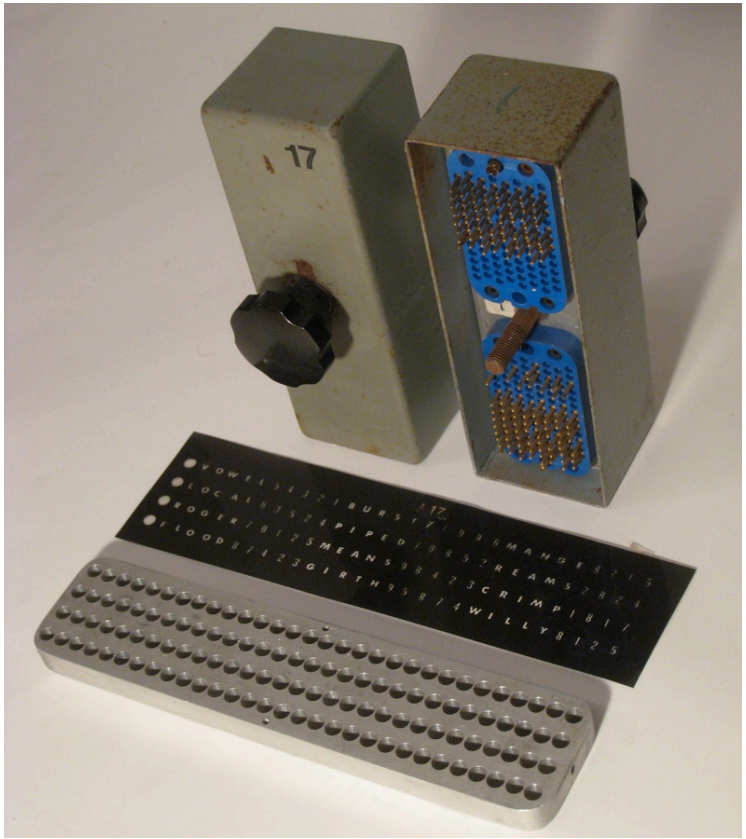
categorizing goals — double-loop system

Pask's Musicolour

- avoids boredom—second-order goal
- ...by varying mapping of sound to light—first-order goal
- ...in response to changing inputs from musician



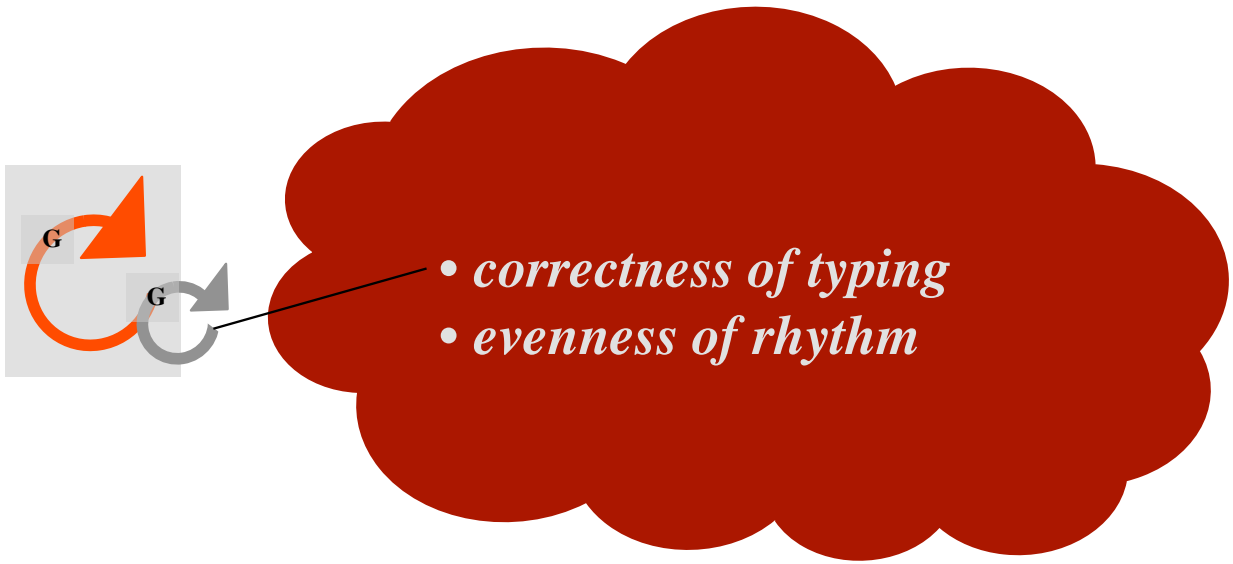
Gordon Pask's Keyboard Trainer



categorizing goals — double-loop system

Pask's Keyboard Trainer

- maintains efficient training—second-order goal
- ...by varying difficulty of exercise—first-order goal
- ...in response to current skill level of learner



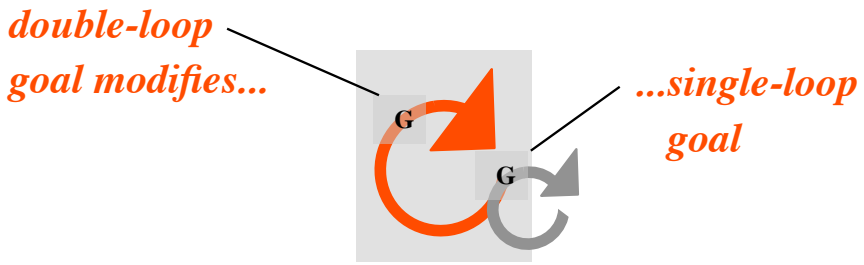
single-loop interactions

single-loop systems ***interact***
while trying to achieve their own, unchangeable goal

- ***thermostat***
- ***cruise control***

double-loop interactions

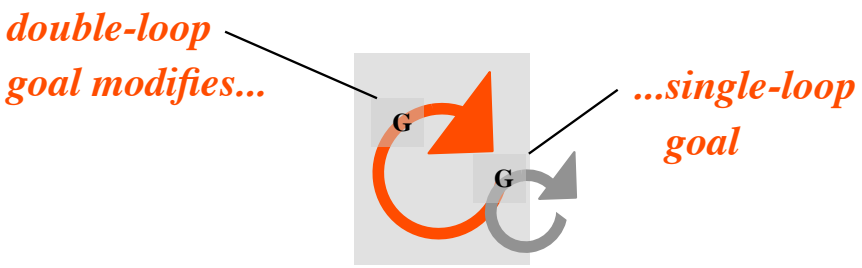
double-loop systems go beyond mere ***interacting*** and ***participate*** in modeling and changing their goals



- *person resetting thermostat*
- *adaptive cruise control*
- *friends deciding on dinner*
- *Pask's machines*

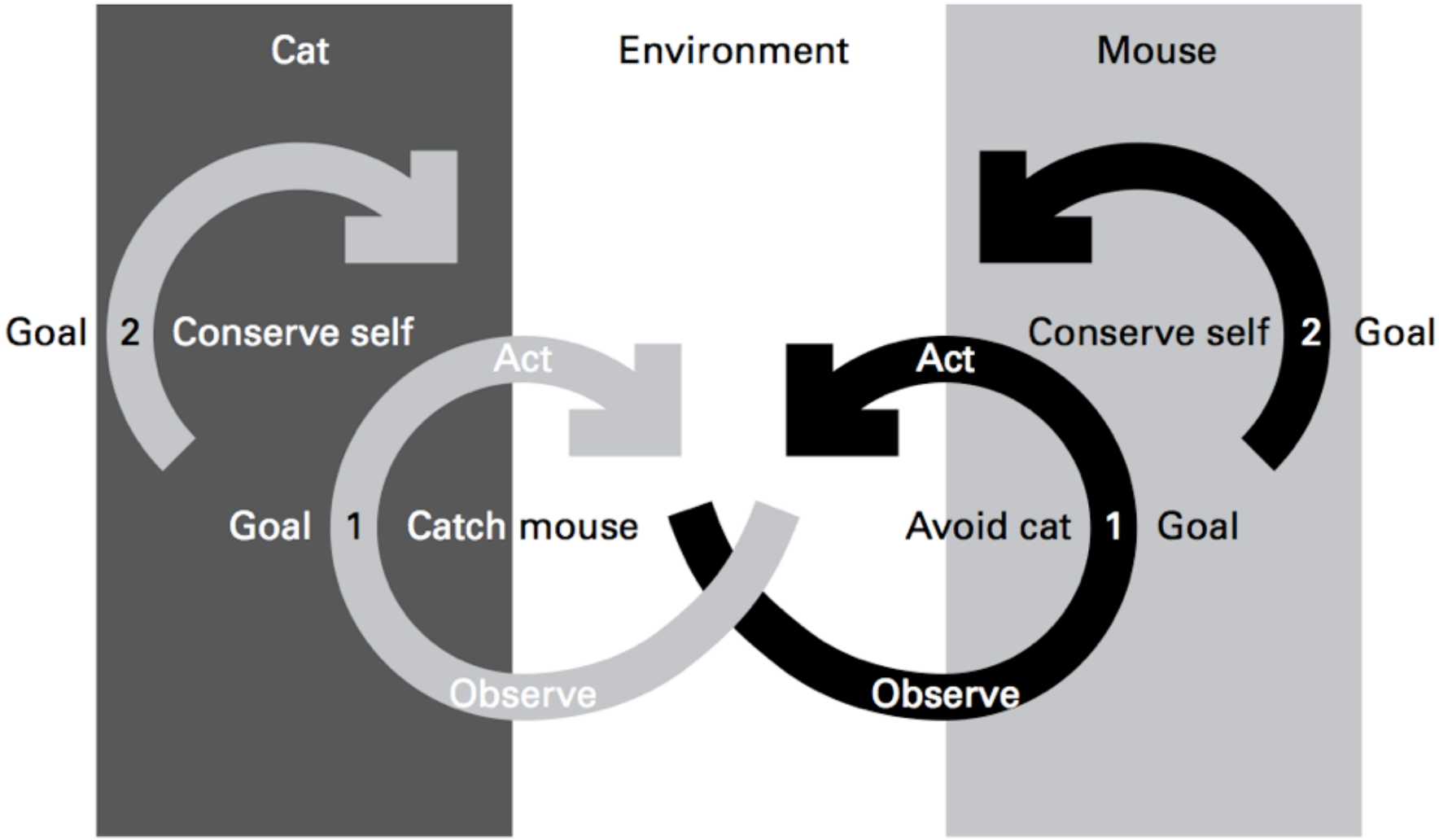
double-loop interactions

double-loop systems go beyond mere ***interacting*** and ***participate*** in modeling and changing their goals ...that is, they are capable of ***learning***

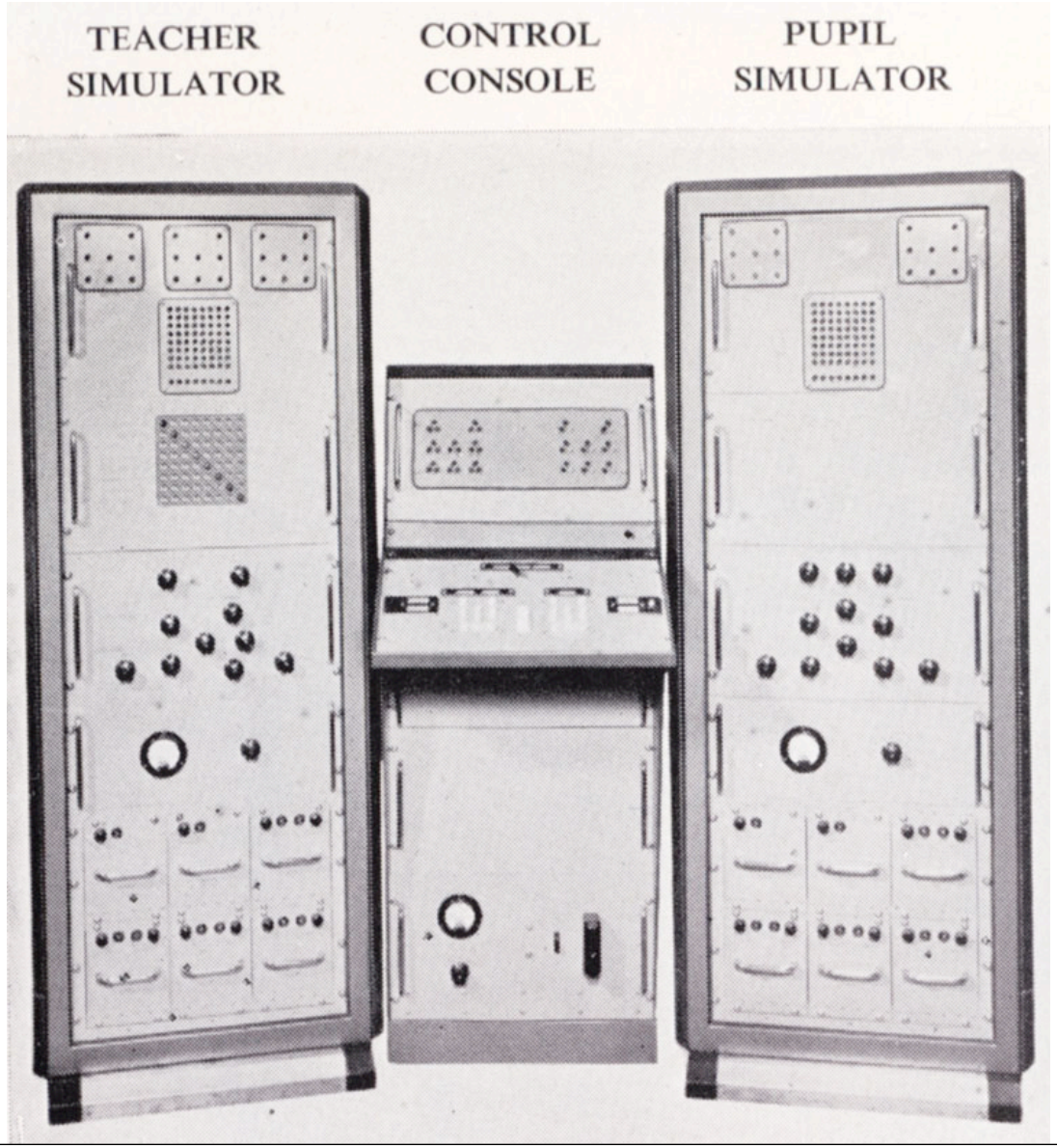


- *person resetting thermostat*
- *adaptive cruise control*
- *friends deciding on dinner*
- *Pask's machines*

example of double-loop learning

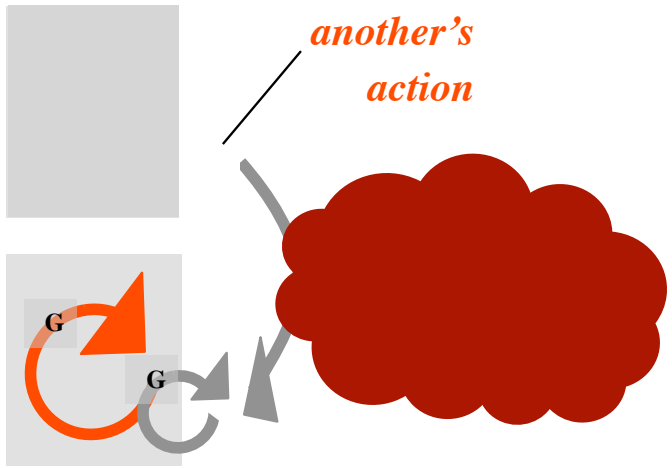


Gordon Pask's Eucrates



participative systems

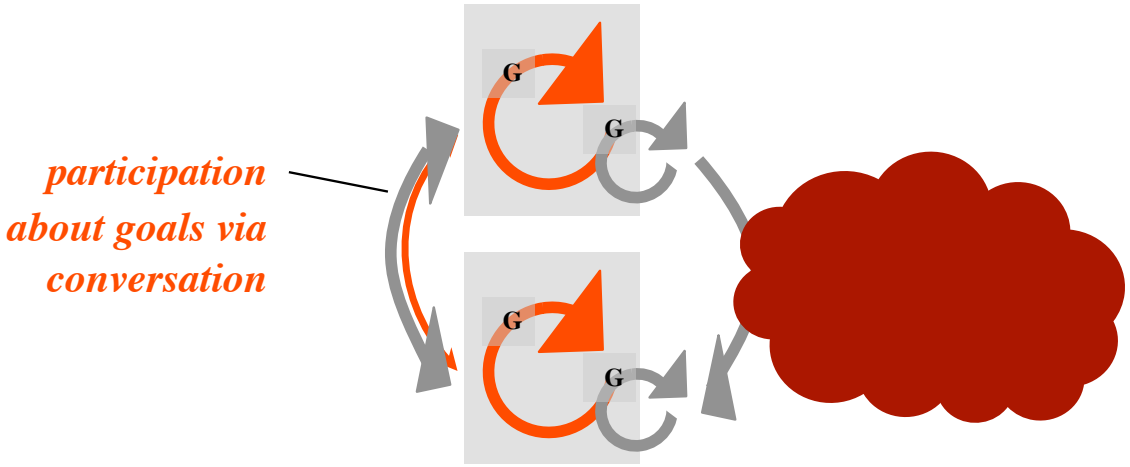
double-loop systems ***participate***
with other systems ***implicitly***
when goals are changed because of another's actions



- ***adaptive cruise control plus driver actions***

participative systems

double-loop systems may ***participate explicitly*** with other double-loop systems in goal-setting by conversing about what is possible & desirable



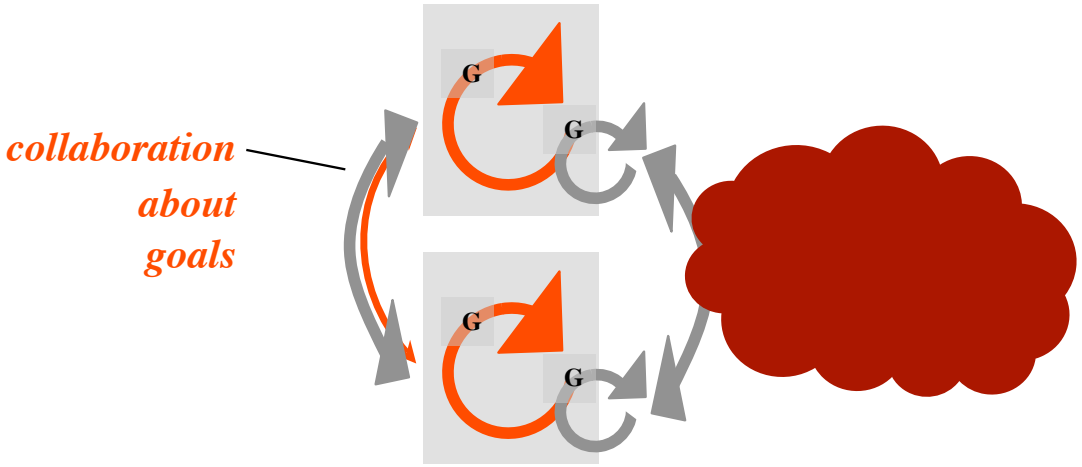
participative systems — definition

- modify themselves as a result of interactions
- participate in changing their goals
- influence other double-loop systems to test and modify *their* goals
- participate in the creation of new possibilities

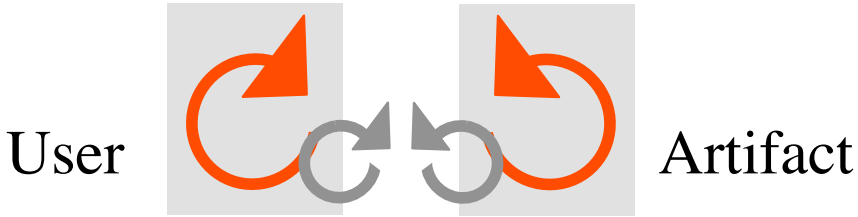
only double-loop systems are participative

participative systems — collaboration

when double-loop systems interact with other double-loop systems for the ***same*** goals, they ***collaborate*** with each other

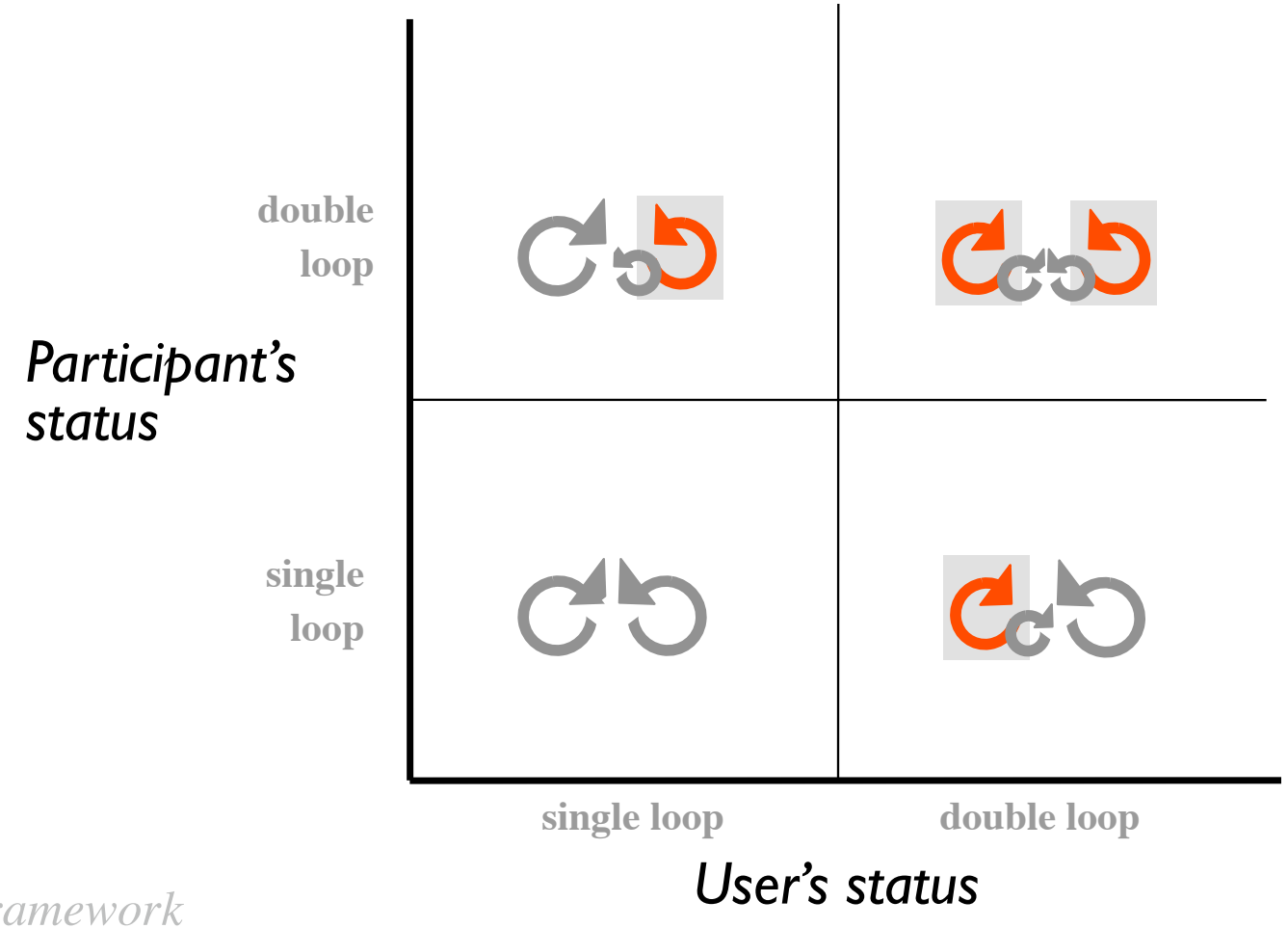


designing interactive systems — humans and technology

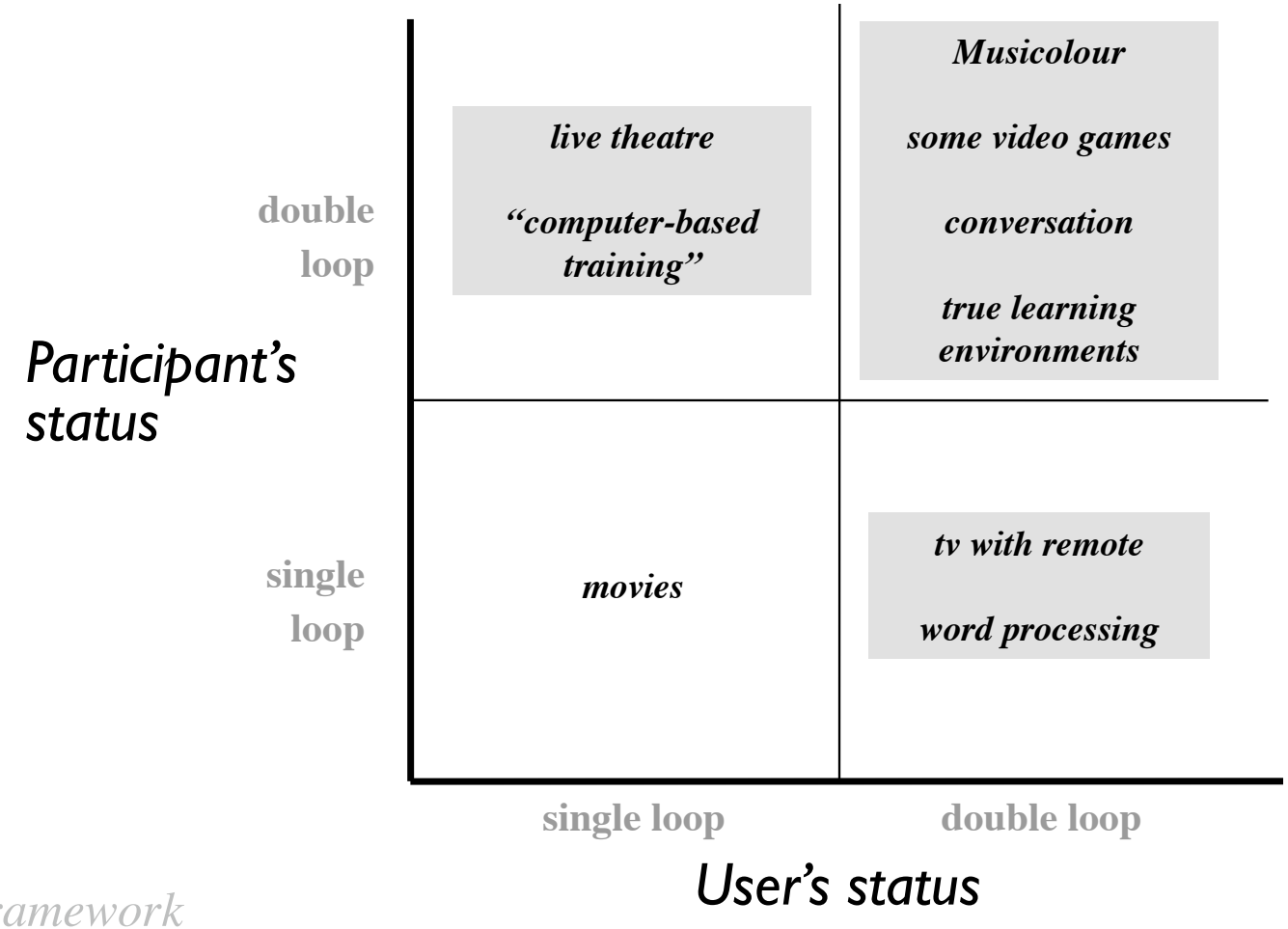


User may be single- or double-loop
Artifact may be single- or double-loop

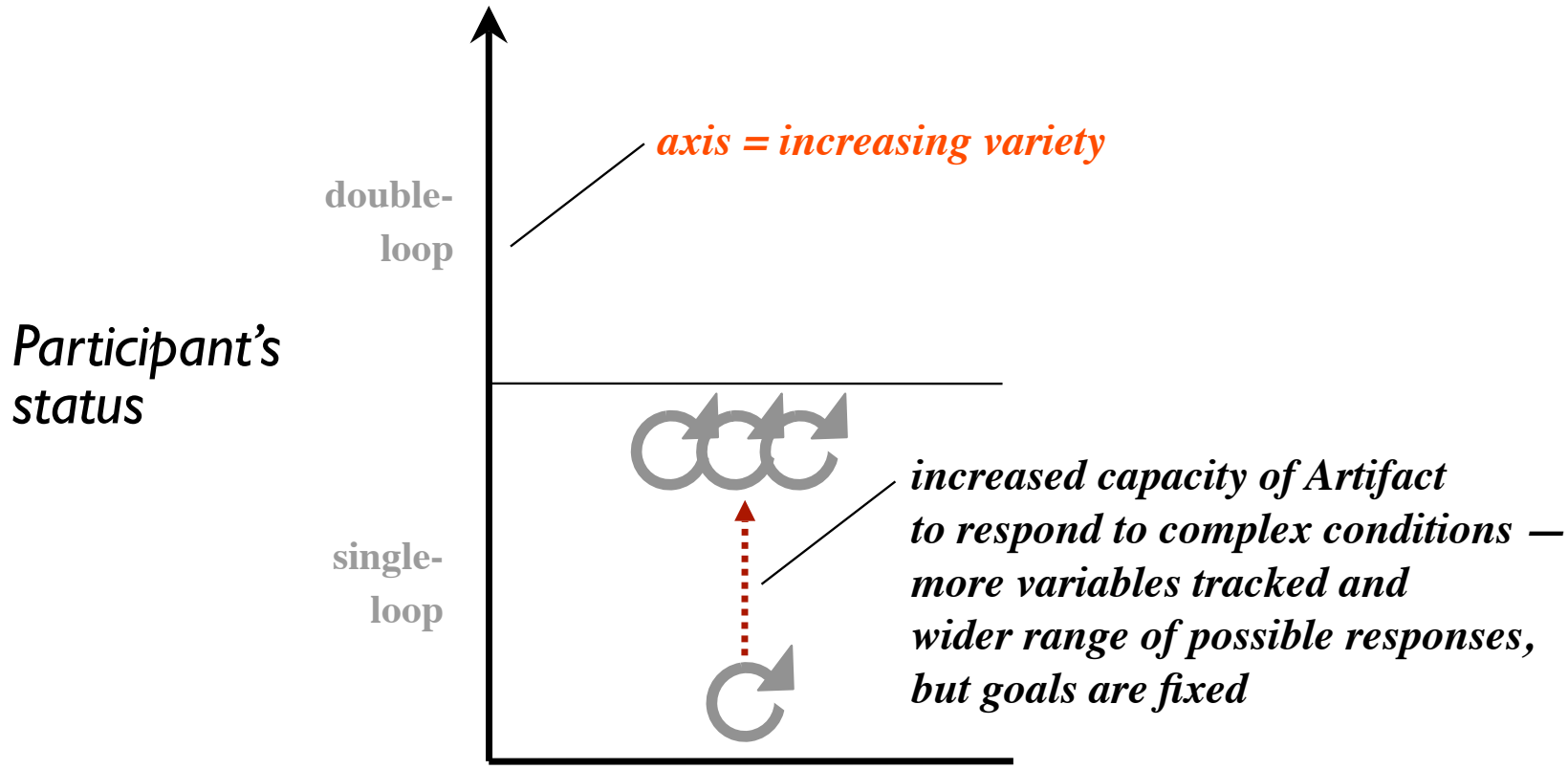
space of participative systems



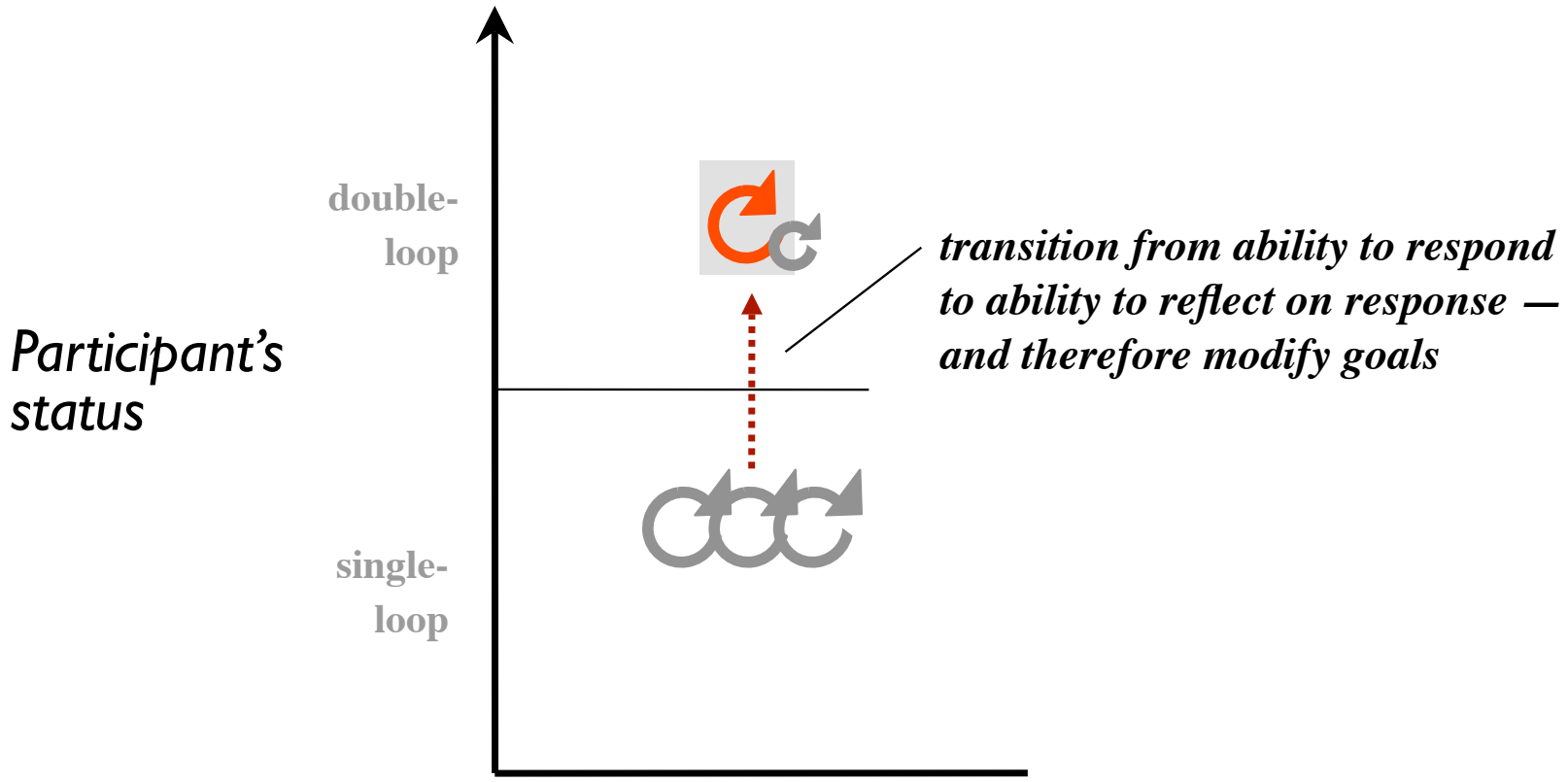
system variations — interactive media



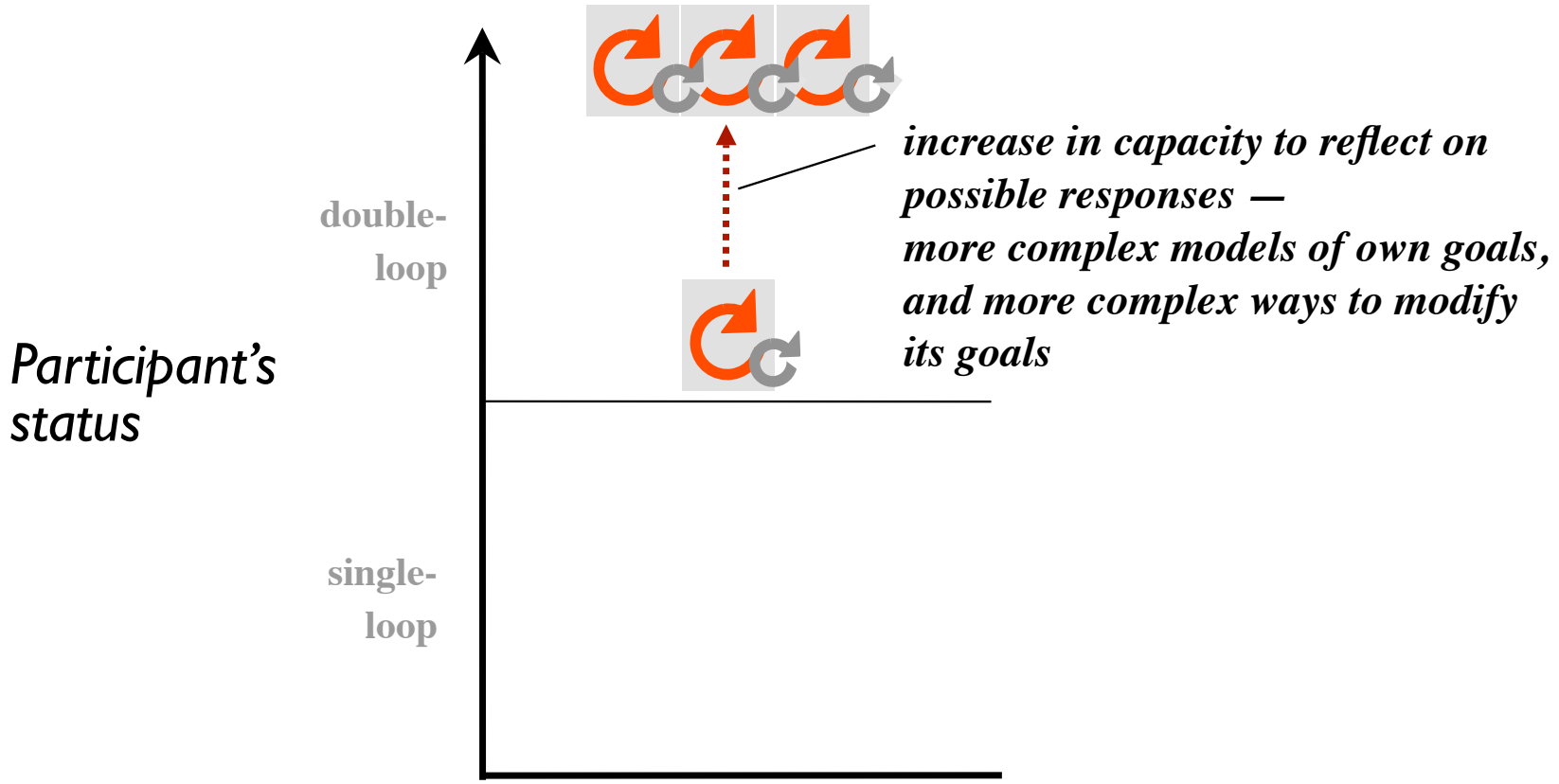
increasing system variety — single-loop



increasing system variety — transition to double loop



increasing system variety — double-loop

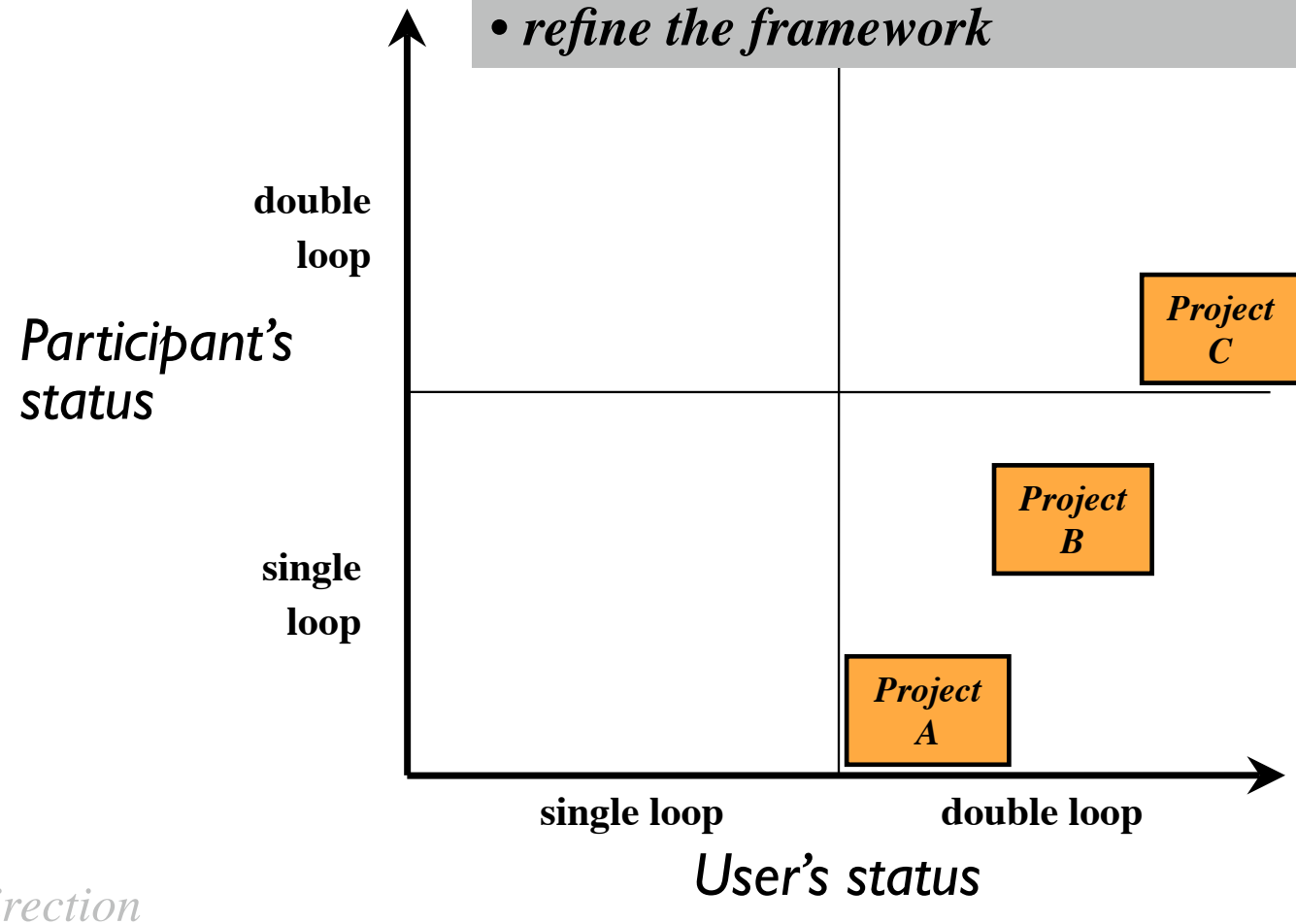


III. propose a research direction

- categorize current research
- propose research metrics
- design demo architecture
- formulate initial questions

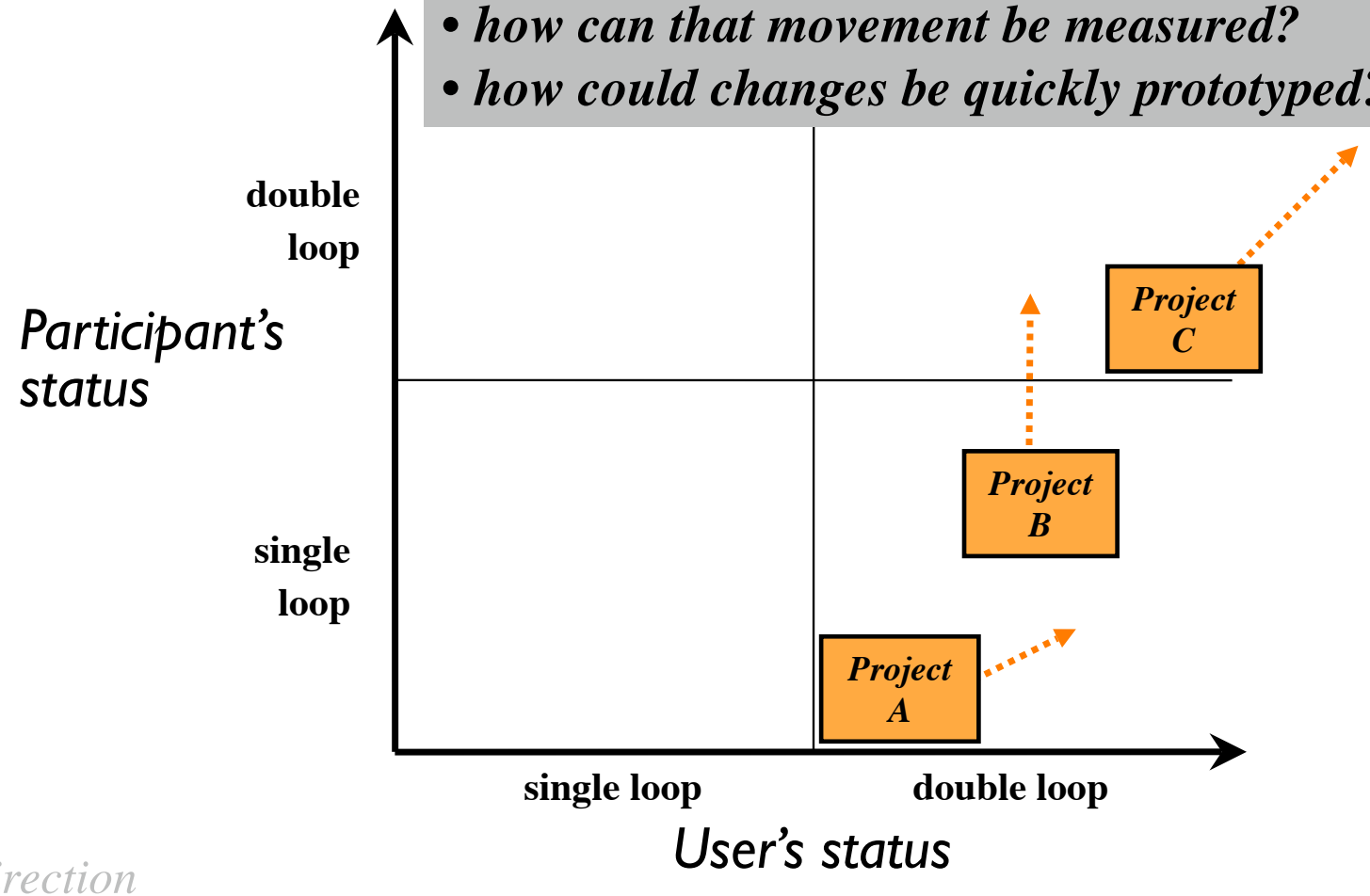
categorize interactive systems

- *use the framework to characterize & compare*
- *refine the framework*



propose interactivity metrics

- *what modifications to an interactive experience would move it toward increasing complexity?*
- *how can that movement be measured?*
- *how could changes be quickly prototyped?*



participants in interaction

- act on their own
- behave in complex ways that make sense to us
- interact with us directly
- work with us in achieving our goals
- modify their own goals
- partner with us in the creation new goals

application of participative systems

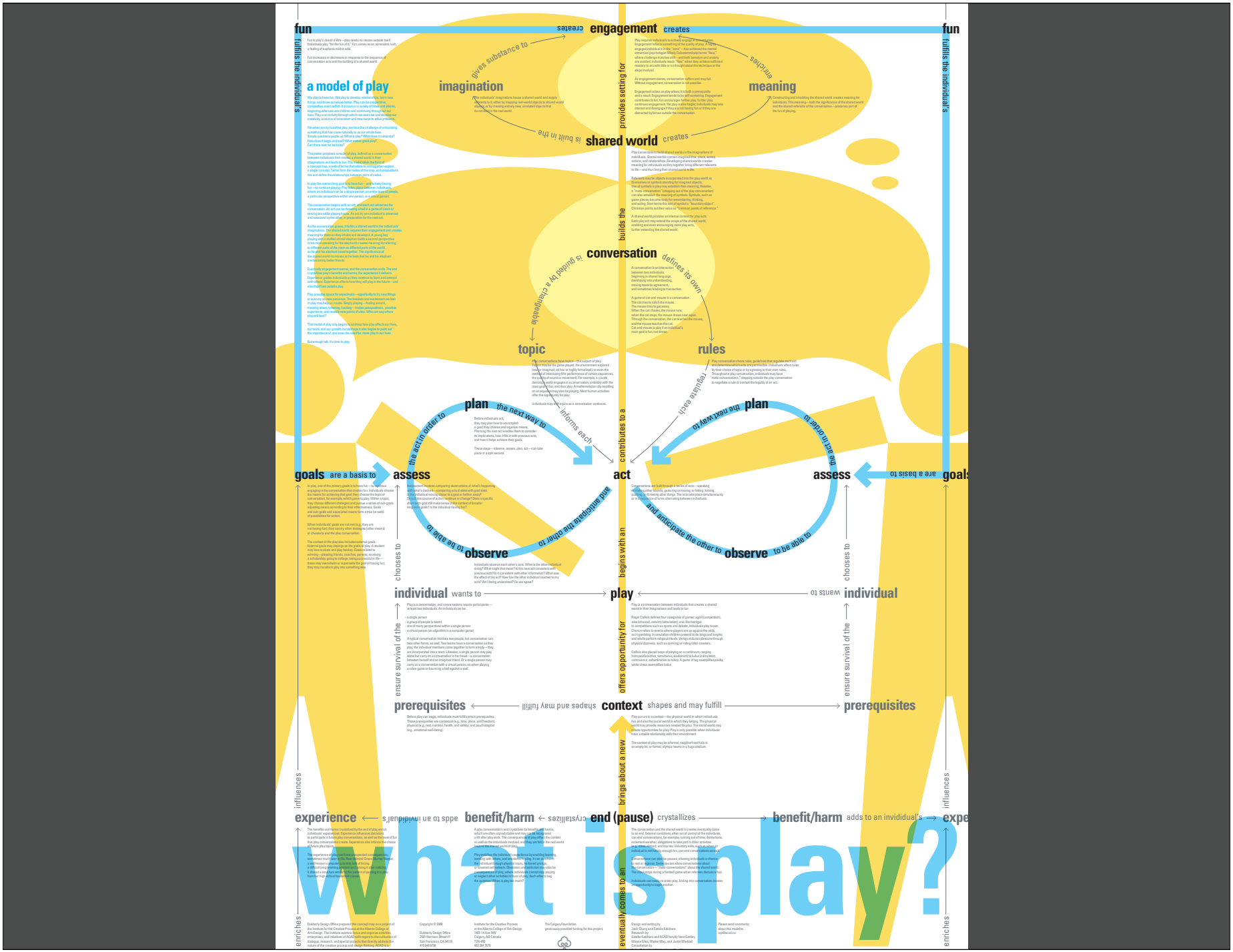
metric of interactivity

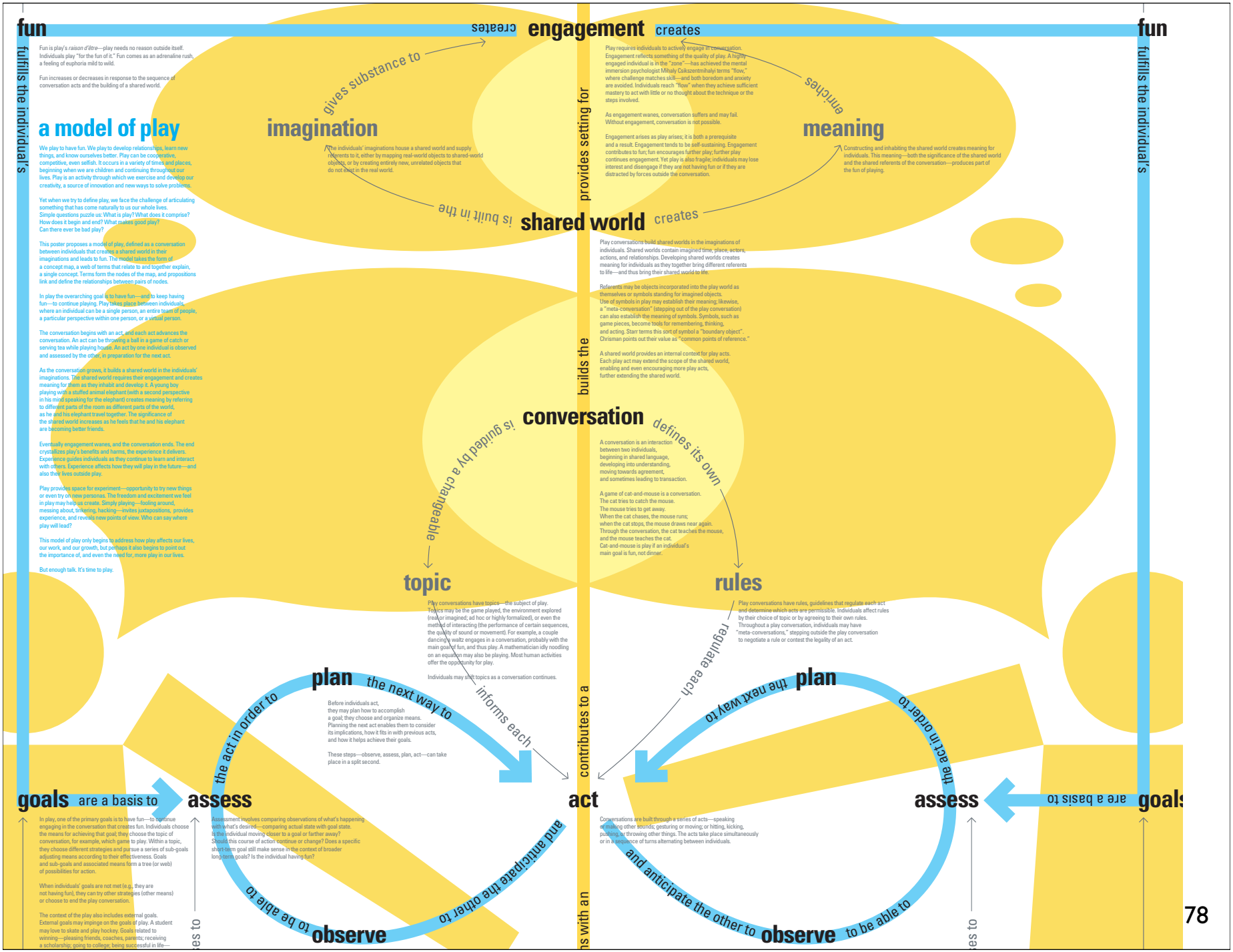
evaluate and compare interactive media, learning environments, exhibitions, online experiences

guidance for improving interactive experiences

urge design changes in the direction of double-loop systems with increased variety


community1
may fail to recognize
pressure (external)
decay (internal)
convention1
each faces
change (disturbance)
context1
(environment)
misfit (pain)
variety
(experiences)
recognition (definition)
(a bit of luck)
innovation
requires
preparation
(immersion)
aids
insight (seeing opportunity)
comes from
individuals
drive
articulation (prototyping)
community2
evaluates
demonstration (testing)
beliefs
may lead to
convention2
creates new
adoption (counter-change)
leads to new
actions
may lead to
artifacts
context2
fit (gain)
is reflected as increased
value
innovation
insight
change
value
convention
convention


fun
engagement
creates
fun
fulfills the individual's
creates
gives substance to
a model of play
imagination
is built in the
shared world
creates
provides setting for
enables
meaning
fulfills the individual's
builds the
conversation
defines its own
is guided by a changeable
topic
rules
regulate each
contributes to a
plan
the next way to
the act in order to
inform each
act
plan
the next way to
the act in order to
goals
are a basis to
assess
and anticipate the other to
to be able to
observe
and anticipate the other to
to be able to
observe
assess
are a basis to
goals
chooses to
begins with an
chooses to
individual
wants to
play
wants to
individual
ensure survival of the
offers opportunity for
ensure survival of the
prerequisites
shapes and may fulfill
context
shapes and may fulfill
prerequisites
influences
brings about a new
influences
experience
adds to an invidual's
benefit/harm
crystallizes
end (pause)
crystallizes
benefit/harm
adds to an invidual's
expe
enriches
eventually comes to an
enriches
what is play?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a model of play
We play to have fun. We play to develop relationships, learn new things, and know ourselves better. Play can be cooperative, competitive, even selfish. It occurs in a variety of times and places, beginning when we are children and continuing throughout our lives. Play is an activity through which we exercise and develop our creativity, a source of innovation and new ways to solve problems.
Yet when we try to define play, we face the challenge of articulating something that has come naturally to us our whole lives. Simple questions puzzle us: What is play? What does it comprise? How does it begin and end? What makes good play? Can there ever be bad play?
This poster proposes a model of play, defined as a conversation between individuals that creates a shared world in their imaginations and leads to fun. The model takes the form of a concept map, a web of terms that relate to and together explain, a single concept. Terms form the nodes of the map, and propositions link and define the relationships between pairs of nodes.
In play the overarching goal is to have fun—and to keep having fun—to continue playing. Play takes place between individuals, where an individual can be a single person, an entire team of people, a particular perspective within one person, or a virtual person.
The conversation begins with an act, and each act advances the conversation. An act can be throwing a ball in a game of catch or serving tea while playing house. An act by one individual is observed and assessed by the other, in preparation for the next act.
As the conversation grows, it builds a shared world in the individuals' imaginations. The shared world requires their engagement and creates meaning for them as they inhabit and develop it. A young boy playing with a stuffed animal elephant (with a second perspective in his mind speaking for the elephant) creates meaning by referring to different parts of the room as different parts of the world, as he and his elephant travel together. The significance of the shared world increases as he feels that he and his elephant are becoming better friends.
Eventually engagement wanes, and the conversation ends. The end crystallizes play's benefits and harms, the experience it delivers. Experience guides individuals as they continue to learn and interact with others. Experience affects how they will play in the future—and also their lives outside play.
Play provides space for experiment—opportunity to try new things or even try on new personas. The freedom and excitement we feel in play may help us create. Simply playing—fooling around, messing about, tinkering, hacking—invites juxtapositions, provides experience, and reveals new points of view. Who can say where play will lead?
This model of play only begins to address how play affects our lives, our work, and our growth, but perhaps it also begins to point out the importance of, and even the need for, more play in our lives.
But enough talk. It's time to play.
Fun is play's *raison d'être*—play needs no reason outside itself. Individuals play "for the fun of it." Fun comes as an adrenaline rush, a feeling of euphoria mild to wild.
Fun increases or decreases in response to the sequence of conversation acts and the building of a shared world.
The individuals' imaginations house a shared world and supply referents to it, either by mapping real-world objects to shared-world objects, or by creating entirely new, unrelated objects that do not exist in the real world.
Play requires individuals to actively engage in conversation. Engagement reflects something of the quality of play. A highly engaged individual is in the "zone"—has achieved the mental immersion psychologist Mihaly Csikszentmihalyi terms "flow," where challenge matches skill—and both boredom and anxiety are avoided. Individuals reach "flow" when they achieve sufficient mastery to act with little or no thought about the technique or the steps involved.
As engagement wanes, conversation suffers and may fail. Without engagement, conversation is not possible.
Engagement arises as play arises; it is both a prerequisite and a result. Engagement tends to be self-sustaining. Engagement contributes to fun; fun encourages further play; further play continues engagement. Yet play is also fragile; individuals may lose interest and disengage if they are not having fun or if they are distracted by forces outside the conversation.
Constructing and inhabiting the shared world creates meaning for individuals. This meaning—both the significance of the shared world and the shared referents of the conversation—produces part of the fun of playing.
Play conversations build shared worlds in the imaginations of individuals. Shared worlds contain imagined time, place, actors, actions, and relationships. Developing shared worlds creates meaning for individuals as they together bring different referents to life—and thus bring their shared world to life.
Referents may be objects incorporated into the play world as themselves or symbols standing for imagined objects. Use of symbols in play may establish their meaning; likewise, a "meta-conversation" (stepping out of the play conversation) can also establish the meaning of symbols. Symbols, such as game pieces, become tools for remembering, thinking, and acting. Starr terms this sort of symbol a "boundary object". Chrisman points out their value as "common points of reference."
A shared world provides an internal context for play acts. Each play act may extend the scope of the shared world, enabling and even encouraging more play acts, further extending the shared world.
A conversation is an interaction between two individuals, beginning in shared language, developing into understanding, moving towards agreement, and sometimes leading to transaction.
A game of cat-and-mouse is a conversation. The cat tries to catch the mouse. The mouse tries to get away. When the cat chases, the mouse runs; when the cat stops, the mouse draws near again. Through the conversation, the cat teaches the mouse, and the mouse teaches the cat. Cat-and-mouse is play if an individual's main goal is fun, not dinner.
Play conversations have topics—the subject of play. Topics may be the game played, the environment explored (real or imagined; ad hoc or highly formalized), or even the method of interacting (the performance of certain sequences, the quality of sound or movement). For example, a couple dancing a waltz engages in a conversation, probably with the main goal of fun, and thus play. A mathematician idly noodling on an equation may also be playing. Most human activities offer the opportunity for play.
Individuals may shift topics as a conversation continues.
Play conversations have rules, guidelines that regulate each act and determine which acts are permissible. Individuals affect rules by their choice of topic or by agreeing to their own rules. Throughout a play conversation, individuals may have "meta-conversations," stepping outside the play conversation to negotiate a rule or contest the legality of an act.
Before individuals act, they may plan how to accomplish a goal; they choose and organize means. Planning the next act enables them to consider its implications, how it fits in with previous acts, and how it helps achieve their goals.
These steps—observe, assess, plan, act—can take place in a split second.
Assessment involves comparing observations of what's happening with what's desired—comparing actual state with goal state. Is the individual moving closer to a goal or farther away? Should this course of action continue or change? Does a specific short-term goal still make sense in the context of broader long-term goals? Is the individual having fun?
Conversations are built through a series of acts—speaking or making other sounds, gesturing or moving, or hitting, kicking, pushing, or throwing other things. The acts take place simultaneously or in a sequence of turns alternating between individuals.
In play, one of the primary goals is to have fun—to continue engaging in the conversation that creates fun. Individuals choose the means for achieving that goal; they choose the topic of conversation, for example, which game to play. Within a topic, they choose different strategies and pursue a series of sub-goals adjusting means according to their effectiveness. Goals and sub-goals and associated means form a tree (or web) of possibilities for action.
When individuals' goals are not met (e.g., they are not having fun), they can try other strategies (other means) or choose to end the play conversation.
The context of the play also includes external goals. External goals may impinge on the goals of play. A student may love to skate and play hockey. Goals related to winning—pleasing friends, coaches, parents; receiving a scholarship; going to college; being successful in life—

Models for Innovation and Interaction

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