Alfred Holl

Popper's epistemological meta-model

1 Motivation 1

1.1 External world

Everyday life and
empirical sciences, such as the natural sciences,
assume the existence of an external world (e.g. organizations)
surrounding humans.
It is partly observable by humans.
Its existence is independent of human observation.
Its behavior can be influenced by human observation (IV.4).

Human observers are able
to internally reconstruct parts of this external world
(in contrast to the opinions
of radical constructivism and solipsism).

In "Empiristic approaches to IS modeling",
it is shown that IS can be considered as an empirical science.

This concept leads to Popper's World 1.

1 Motivation 2

1.2 Models 1

Properties:
– more or less complex descriptive categories
– human artifacts (no photos, see illustration),
– non-isomorphous images of segments of reality
– results of active interpretation of reality
– dropping some properties of objects of reality (e.g., size, life etc.)
– simplifying, reducing complexity on a higher level of abstraction
– constructed with a certain modeling purpose,
– answering a certain modeling question.

Examples:
Toys (model railway, doll), drawings, formulae etc.

Some problems:
Reduction of aspects of reality: particle – wave, data – function.
Impossible to design a complete model of a segment of reality.
Segmentation cuts off external interdependencies.
Models are only accessible / available via model representations (analogy: reality is only accessible via mental representations)

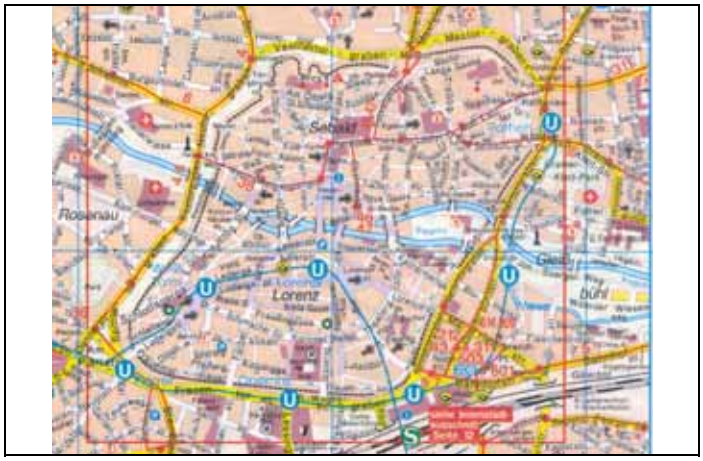
There aren't any models without human model designers:

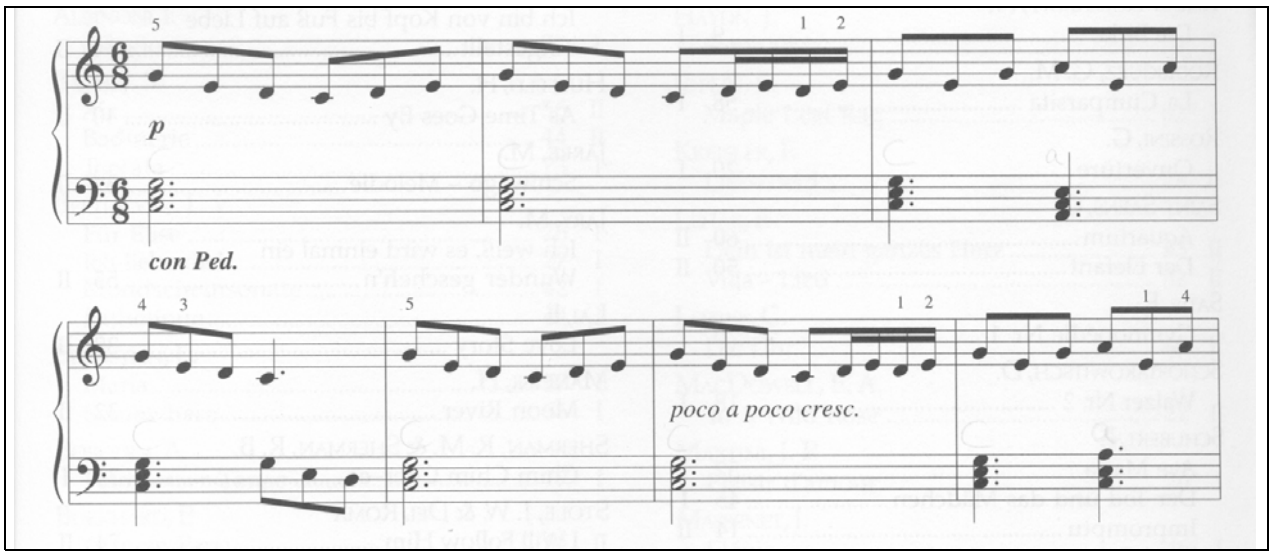
"A problem is not solved in the computer,
but in someone's head."
Charles Kettering

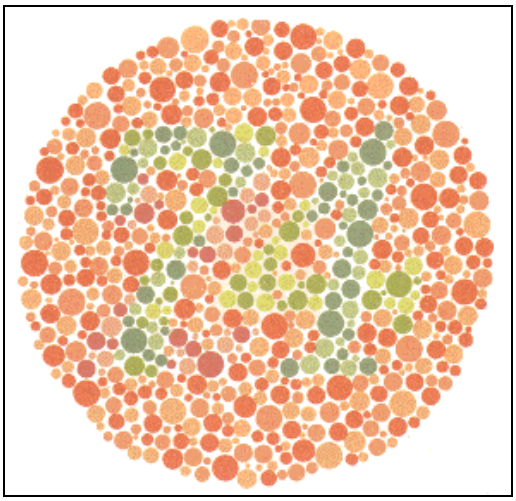
This concept leads to Popper's World 3.

1 Motivation 3

1.2 Models 2







Ishihara table

1 Motivation 4

1.3 Phenomena 1

φαίνω 'to make perceptible'

A phenomenon is
– a personal, individual experience
– a personal, individual mental
reconstruction / representation of a W1 segment,
– the shape in which a thing in itself appears to an individual,
in particular to human consciousness
– a retro-projection of a perception to reality
cf. meaning of 'phenomenon' in everyday language
– an approximation of a thing in itself

A phenomenon is produced
by the cognitive / perceiving / world-depicting apparatus from
– external stimuli (world 1)
– memory

Phenomena of the same thing in itself can be different
due to differences in the cognitive equipment:
natural perception:
– color-blind people
– bats: radar
– bees: UV (sun 'visible' through clouds)
– ticks: temperature and smell
instrumental perception:
– X-ray photos
– oscilloscopes
– IR photography

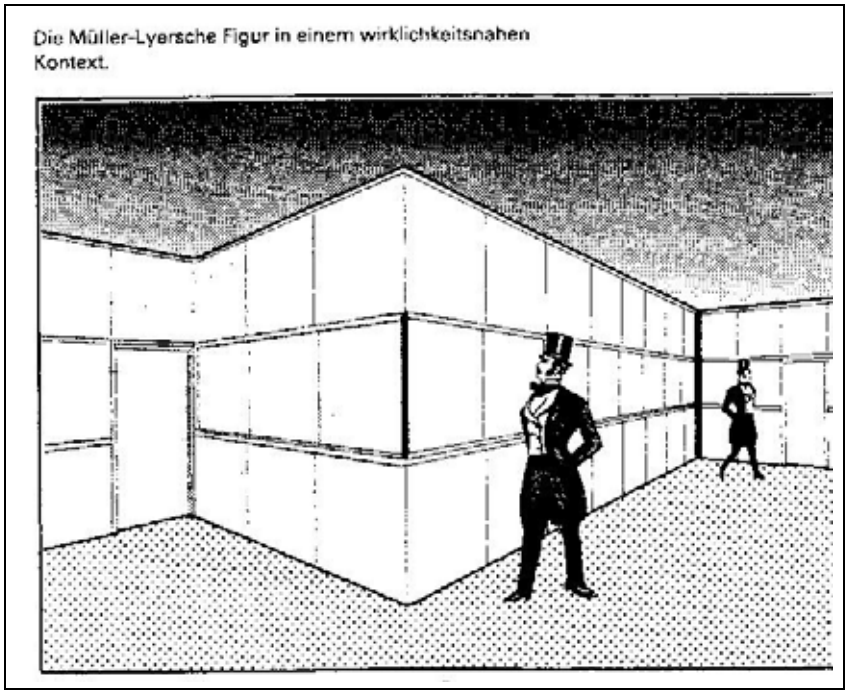
This concept leads to Popper's World 2.

1 Motivation 5

1.3 Phenomena 2

***** optical illusion (squares)**

What is this?



Müller-Lyer's optical illusion (Rock, Wahrnehmung, 1984, 139)

2 Karl Popper's ontological theory 1

Popper's model gives an ontological differentiation and states which levels of existence of objects of cognition are possible.

World 1: "nature", even physical artifacts created by humans; contains
things in itself (perceivable to some extent)

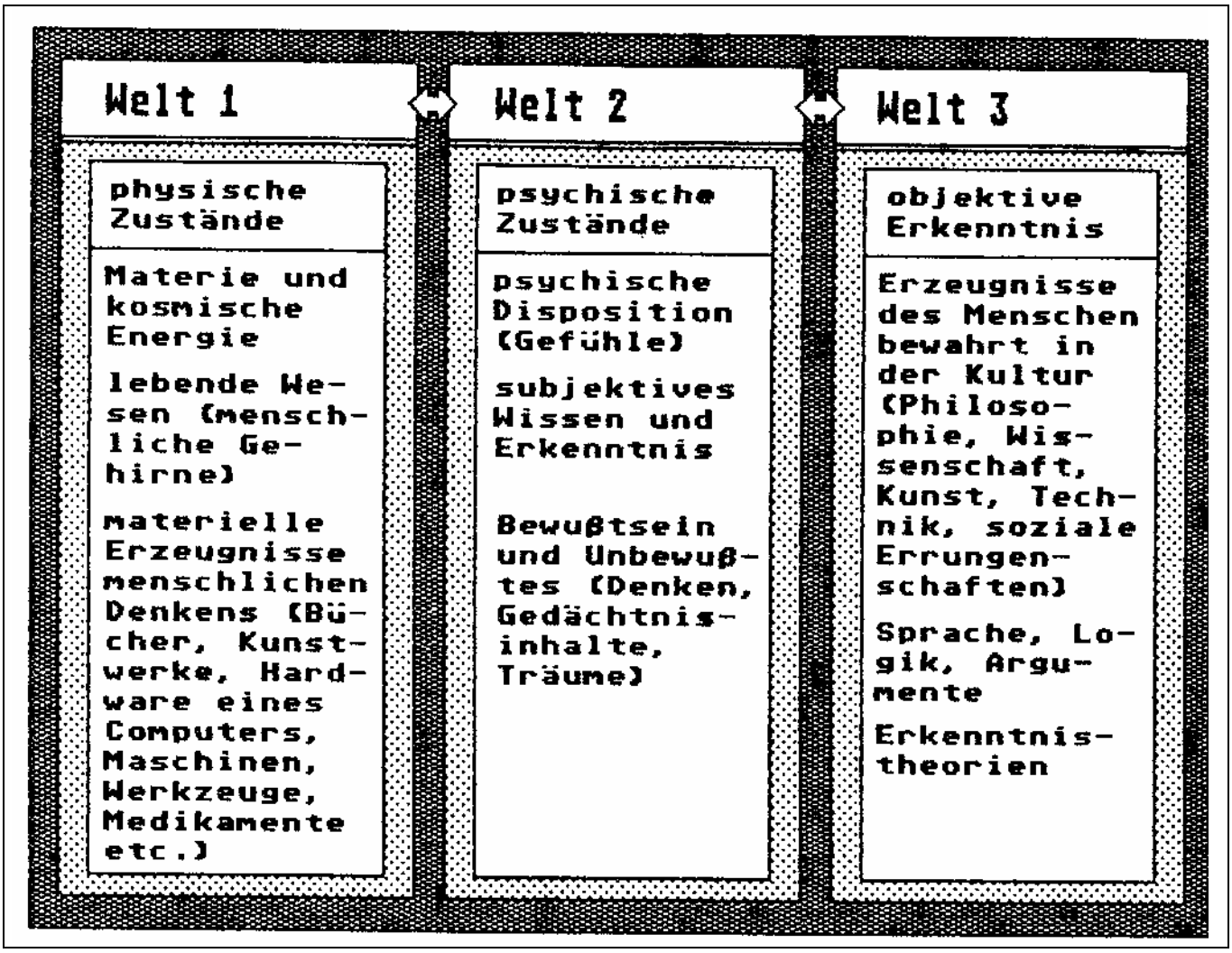
World 2: "human", world of phenomena, individual experiences; contains
– phenomena: perceived (induced by W1)
→ gestalt-theoretical pictures (optical illusions)
– activations: learnt (induced by W3)
– memory

World 3: "culture": world of models, concepts, ideas;
contains
dependent re-constructions and independent constructions
– dependent concepts with empirical basis: descriptions
– independent concepts without empirical basis: ideas, νούμενα
(Kant's dove: assumption that flying is easier in the vacuum)

Popper's three worlds correspond to
three ontological levels of existence:
"absolute" reality, individual experience and description

Terminological differentiation in IS between reality and model:
real object vs OO object, data entity
course of events vs business process

2 Karl Popper's ontological theory 2



(Ebeling, Gehirn, Sprache und Computer, 1988, 64)

2 Karl Popper's ontological theory 3

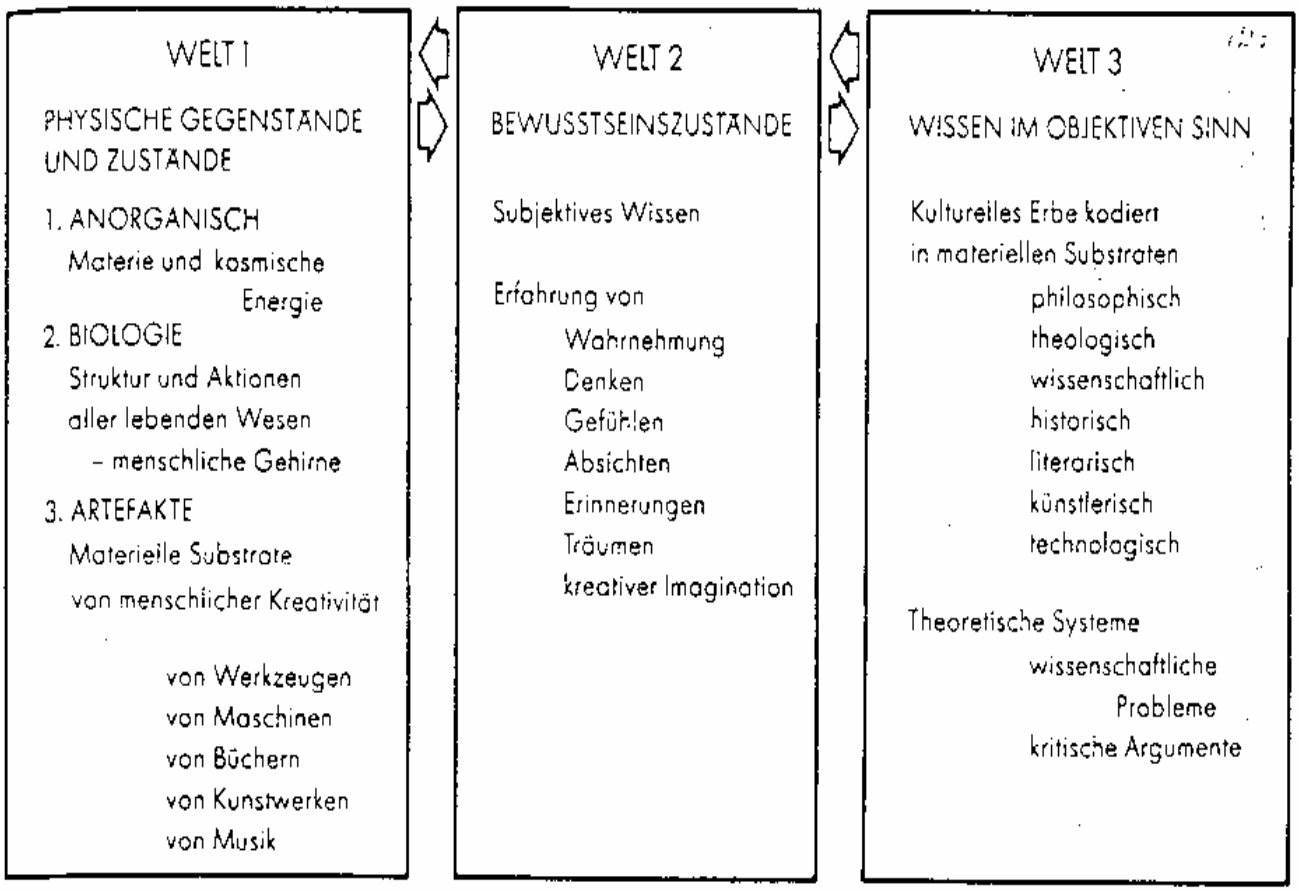


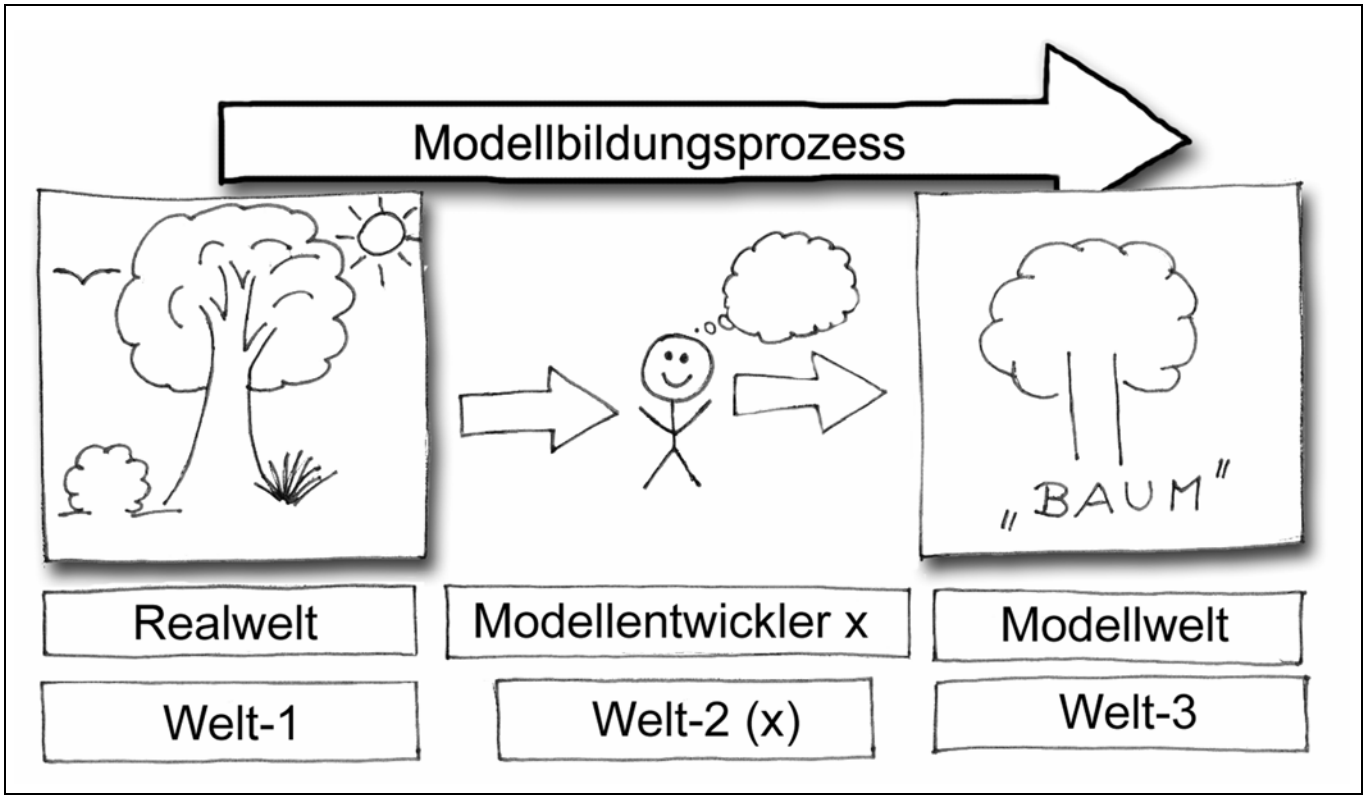
Abb. E7–1. Tabellarische Darstellung der drei Welten, die alles Existierende und alle Erfahrungen umfassen, wie von Popper definiert (Eccles [1970]).

(Popper / Eccles, Das Ich und sein Gehirn, 1994 [1977], 433)

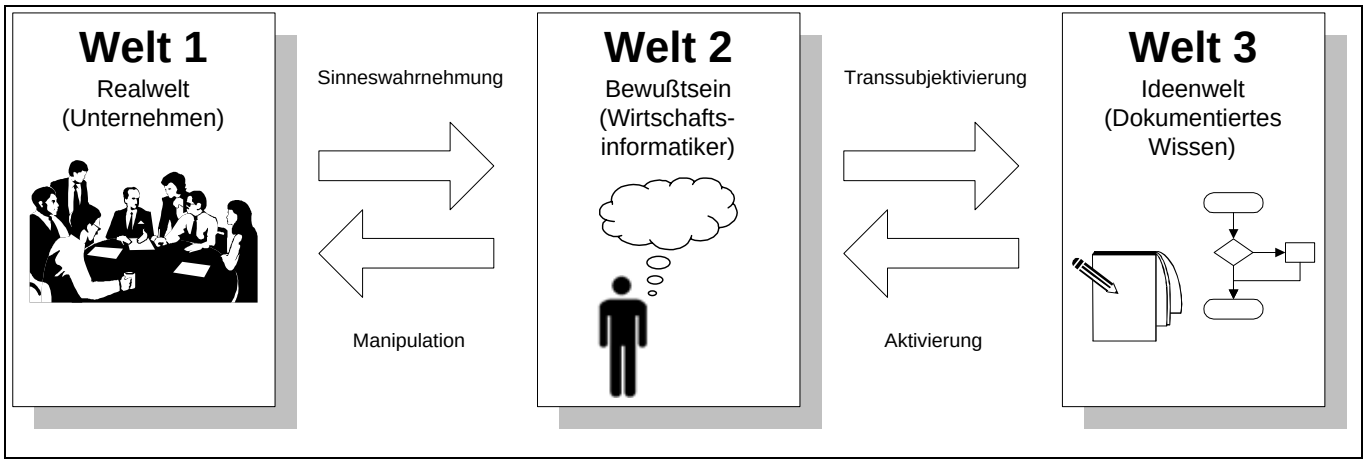
3 Remarks 1

3.1 Popper's three worlds and IS 1

3.1.1 Visualization of the modeling process 1



(Holl / Krach, Ubiquitärer naiver Realismus, 2002, 54)

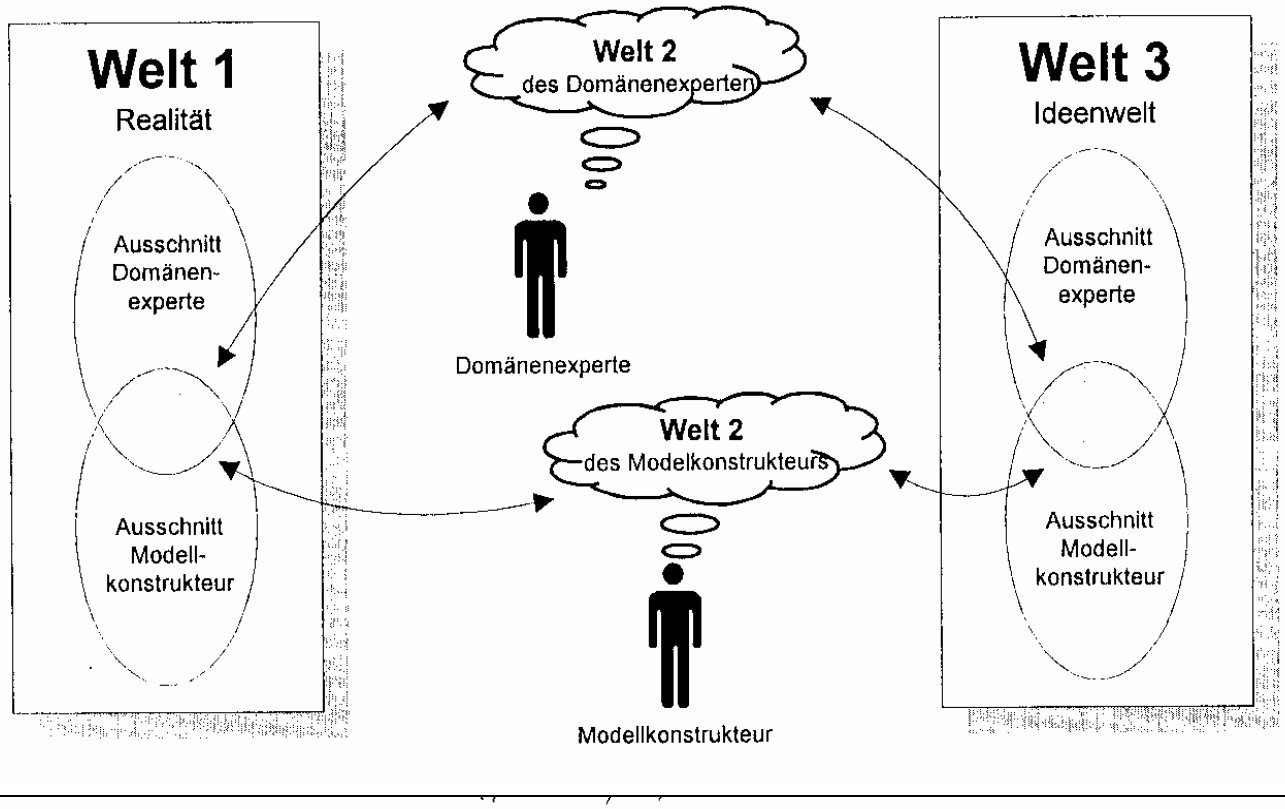


(Holl / Scholz, Objektorientierung und Popper, 1999, 98)

3 Remarks 2

3.1 Popper's three worlds and IS 2

3.1.1 Visualization of the modeling process 2



Damit die beiden Personen also Informationen austauschen können, müssen sie bei der Kommunikation den **"Umweg"** über Welt 1 bzw. Welt 3 nehmen. Das bedeutet, daß bei jeder Kommunikation zwischen ihnen **mindestens zwei Weltenübergänge** vollzogen werden.

(Holl / Scholz, Objektorientierung und Popper, 1999)

3 Remarks 3

3.1 Popper's three worlds and IS 3

3.1.2 Terminological distinction between reality and model

Popper's World 1	Popper's World 3
"nature" world of reality absolute reality outside universe natural universe world to be described	"culture" world of models/concepts/ideas descr. empirical reality c W3 inside universe discursive universe describing world c W3
categories of reality reality-immanent categories things in itself (Kant), (objects, situations, processes), real objects	categories of models descriptive categories (numbers, God) common mental reconstructions, comm. mental representations, comm. mental interpretations
real object set of similar real objects real process in an organization set of similar real processes	OO object, DB entity object type (class), entity type business process instance business process (type)
sensorily perceivable world 'ορατὸς τόπος basis of empirism	mentally perceivable world νοητὸς τόπος c W3 basis of rationalism

3 Remarks 4

3.2 Remarks on Popper's World 3

Remark 1:
Parallels between Popper's three worlds and linguistic structuralism (Geneva school).
Once more: What is a model?

Models can be regarded as bilateral semiotic signs (trilateral sem. sign: in addition, reference to object of cognition):

Popper	World 1	World 2	World 3
model	model representation	code of interpre-tation	model content, model meaning
bilateral semiotic sign	form, vox, signifiant	code of interpre-tation	meaning, conceptus, signifié

Model representation and signifiant belong to World 1 if they are materialized in written or acoustic form, World 2 if they are materializable in a human's brain.

Content / signifié belongs to World 2 and World 3.

Remark 2:
Temporal behavior of World 3

Its contents are temporally dynamic, oscillating:
– permanent / long-term vs. transient / short-term
– written vs. acoustic
– learning and forgetting (extinct languages and characters)

3 Remarks 5

3.3 Remarks on Popper's World 2 - 1

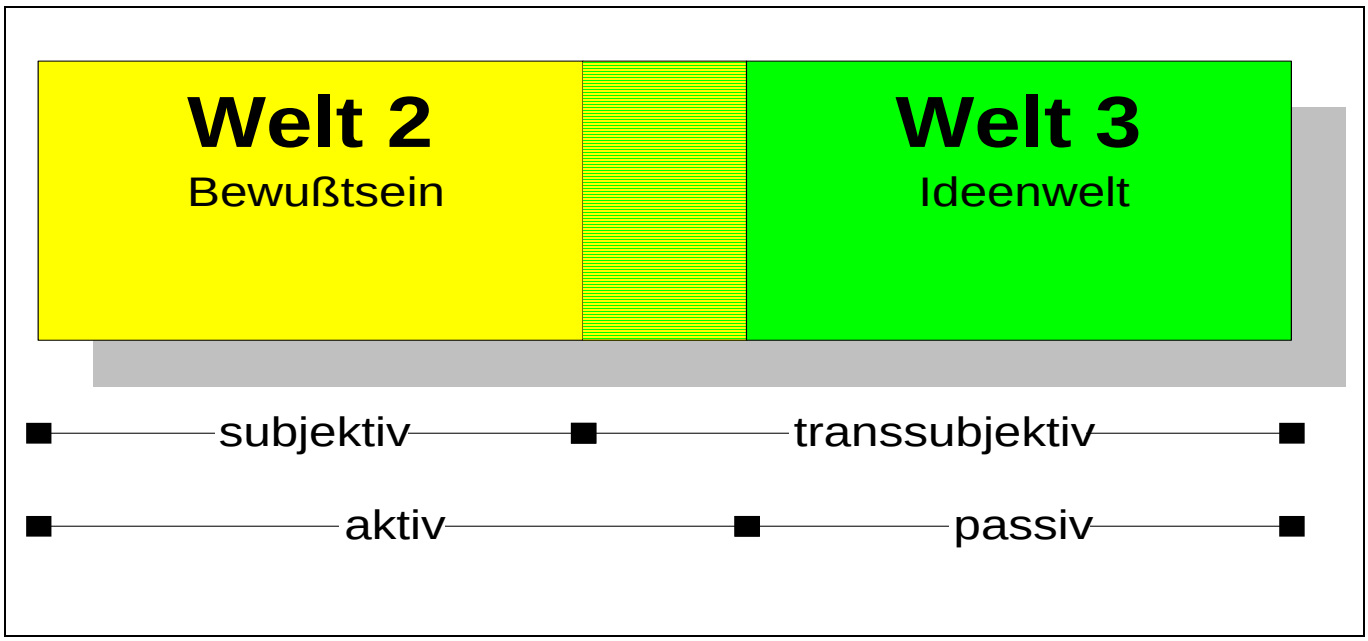
**Individually / personally experienced reality,
individual consciousness of a human being,
e.g. a model designer's thoughts and experiences**

Every human has a World 2 of his / her own.

It contains

– **phenomena (perceived) of segments of world 1 with individual sensory-mental interpretations / reconstructions and descriptions / pre-models in terms of a natural language**

– **activations (learnt) of segments of world 3**



(Holl / Scholz, Objektorientierung und Popper, 1999, 99)

– **personal / individual experiences (stored in a memory) have their origin in former phenomena / activations.**

3 Remarks 6

3.3 Remarks on Popper's World 2 - 2

Popper's World 2 is an extension of the two ancient Greek worlds.

Phenomena are called "Erscheinungen" by Kant.

**Theory / psychology of gestalt contributes a lot
to the understanding of the production of phenomena.**

**Phenomena can be described
using elements of World 3 (language)**

**There is nothing good nor bad,
it is human thinking which makes it appear that way.
No existe nada bueno ni malo:
es el pensamiento humano el que lo hace aparecer así.**
(William Shakespeare)

**→ Definitions are only valid
within the framework of a model / theory.**

**The cognitive apparatus has a material vessel,
therefore, there can be interactions
between the cognitive apparatus and the observed W1 segment.**

3 Remarks 7

3.4 1st epistemological dilemma (not solvable)

World 1 objects:
– "things in itself", Kant: Dinge an sich ("behind" phenomena)
– objects of indirect cognition
– only indirectly accessible / available to human cognition,

that is via World 2 objects:
– phenomena (φαινόμενον), Kant: "Erscheinungen" (e.g. color)
– objects of direct cognition
– object representations [psychoanalysis],
object reconstructions [epistemology]
produced by the human cognitive apparatus
– sensory interpretations of W1 objects
retro-projected onto reality, identified with W1 objects as changes in reconstructions correspond to changes in reality

Dilemma:
Humans need knowledge about World 1 objects of cognition, but can acquire knowledge only about World 2 objects.

The indirect way via W2
is the only way of human empirical cognition,
the only cognitive access to W1!

Therefore,
objects of direct cognition (W2) have an epistemological value
and I use the umbrella term objects of cognition
comprising objects of direct and indirect cognition.

4 Relations between Popper's three worlds 1

W1 → W2

W1 is accessible to human cognition via phenomena in W2 which are produced by the human cognitive apparatus and which can be described by means of language (W3).

W1 ← W2

Humans can influence and modify their habitat:
– technology
– social and political organizations (enterprises, states)
– mathematical structures (accounting)

W2 → W3 (externalization, "inter- / trans-subjectivation")

Every human can contribute to W3 via
– conversation, presentation, talk (short-term contents)
– constructing, documenting and publishing models
– creating words, terminology

A model becomes part of W3 as soon as it is public, i.e.
– it can be communicated, discussed, followed by other people
– it is represented in natural or formal language, diagrams
– it is no longer private, restricted to the model designer's W2

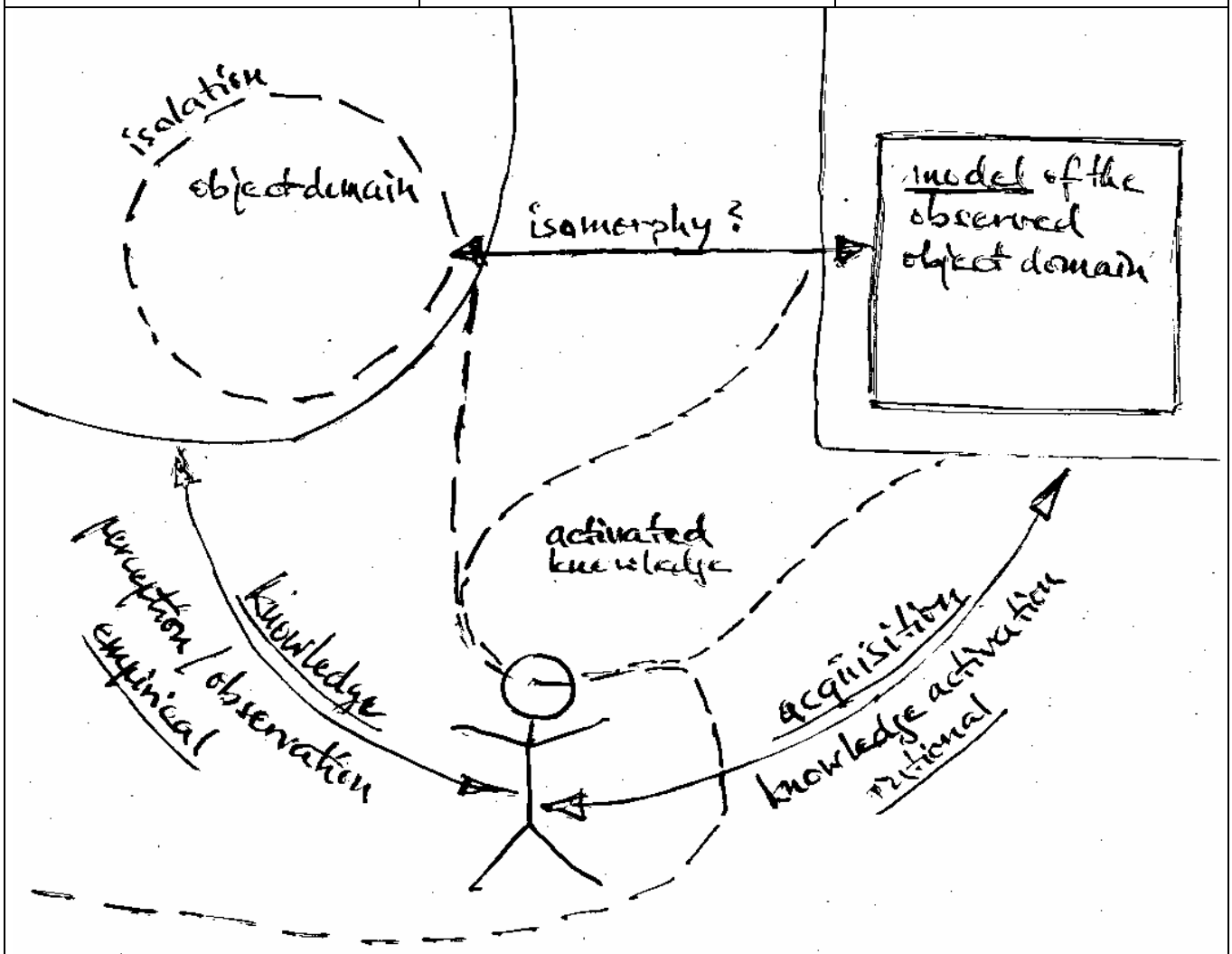
W2 ← W3 (internalization, "intra-subjectivation")

Humans can activate parts / segments of W3 in their W2s.
Humans can't individually repeat the history of the human mind, but they can learn directly from W3 via
– reading books about models, theories, science etc.
– learning languages

W1 ←→ W3

In both directions, there is only an indirect relation via W2.

4 Relations between Popper's three worlds 2



"Hand-made" diagram showing the epistemological situation

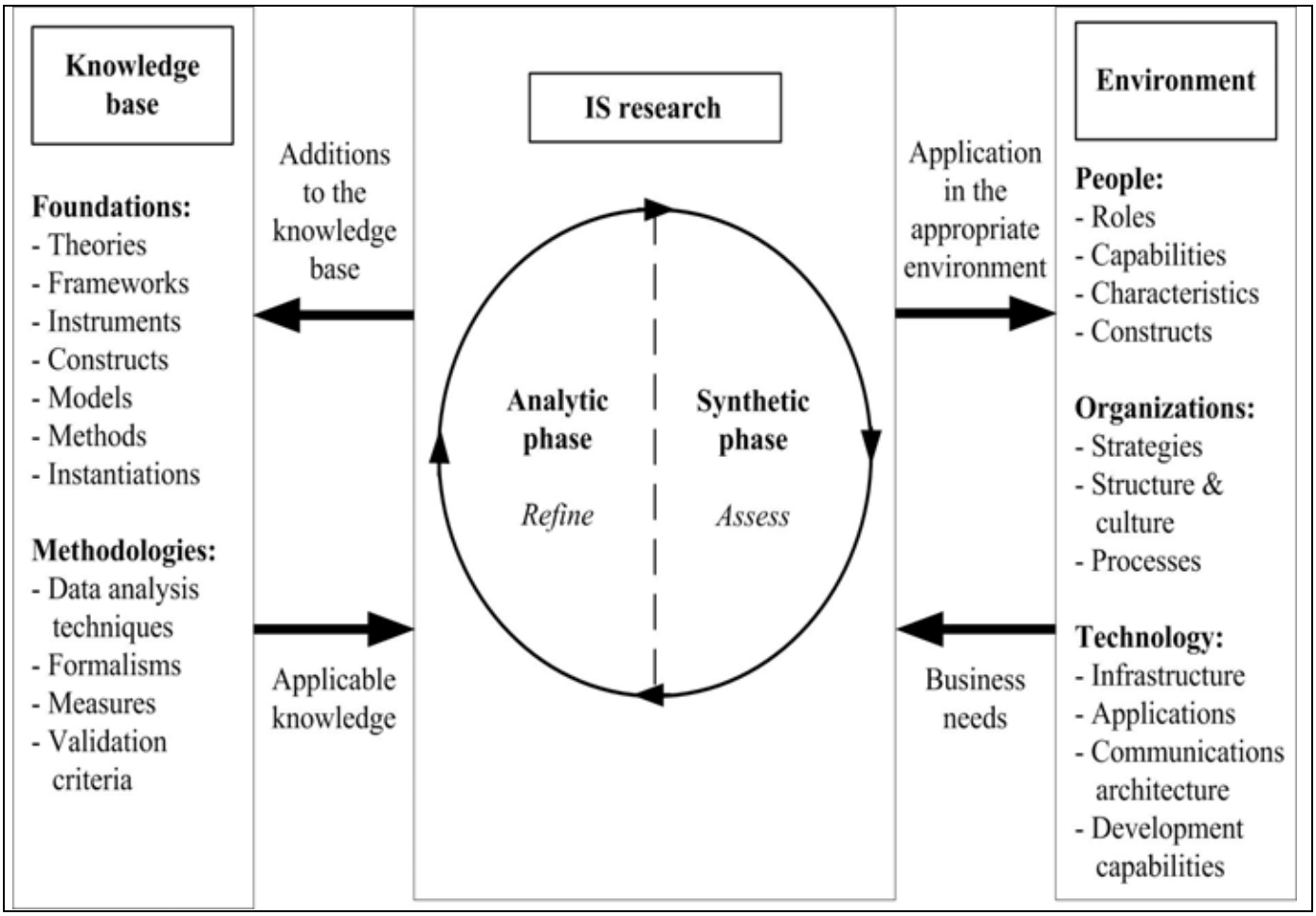
4 Relations between Popper's three worlds 3

external world ↓ World 1 objects of cognition	phenomenon, individual experience ↓ World 2 knowledge of an individual subject of cognition			model, theory ↓ World 3 common knowledge
→	perception, cognitive processes (empiristic) ↓ reconstruct. of World 1 →	memory	learning rationalistic ↓ activations of World 3 ←	←
←	↓ creation, induction ↓ design, influence ←	← new ideas, knowledge →	publi-cation	→

bi/trilateral semiotic sign		
materialized signifiant, vox	code of interpretation	signifié, conceptus W2|W3
object of cog.		

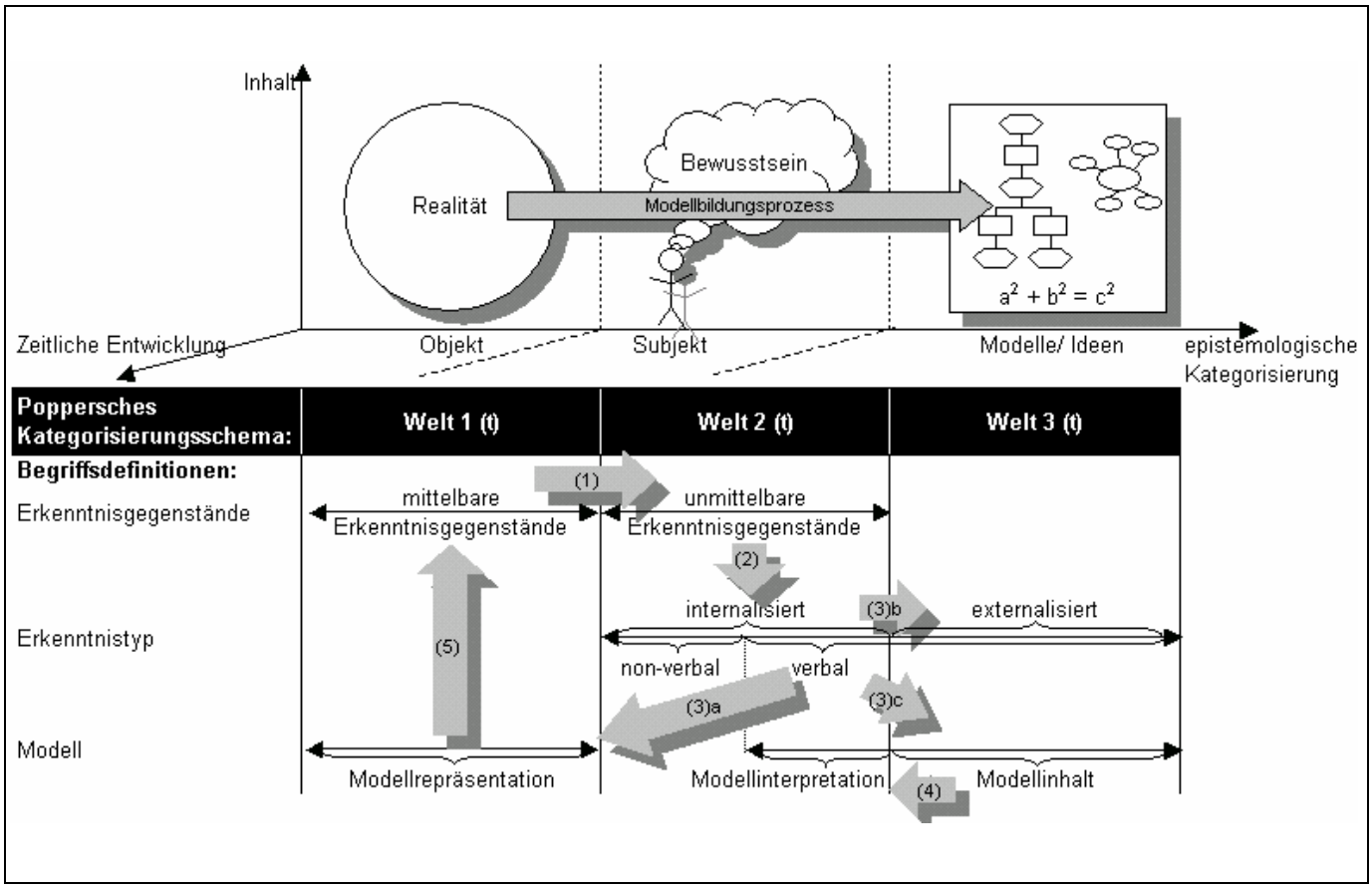
model as complex bi/trilateral semiotic sign		
materialized model repre sentation	code of interpretation	model meaning W2|W3
object of cog.		

4 Relations between Popper's three worlds 4



Embedded mayeutic cycle in IS research
(adapted from
Hevner / March / Park / Ram 2004, 80)

4 Relations between Popper's three worlds 5



Popper's three worlds and terminological definitions:
① perception,
② knowledge gain by abstraction,
③ knowledge representation and -transsubjectivation,
④ activation (via ⑤ + ①).
(Holl / Auerochs, Analogisches Denken, 2004, 371)

5 Summary of Popper's three worlds

W1 contains things in itself (perceivable to some extent)

W2 contains
– phenomena: perceived (induced by W1)
– activations: learnt (induced by W3)
– memory

W3 contains
dependent re-constructions and independent constructions
– dependent concepts with empirical basis: descriptions
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(Kant's dove: assumption that flying is easier in the vacuum)

Popper's model gives an ontological differentiation and states which levels of existence of objects of cognition are possible.

Popper's three worlds correspond to
three ontological levels of existence:
absolute reality, individual experience and description

6 References

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