



Progression and Acceptance of Ideas in Software Engineering

Hakan Erdogmus
Kalemun Research Inc.

November 1, 2009



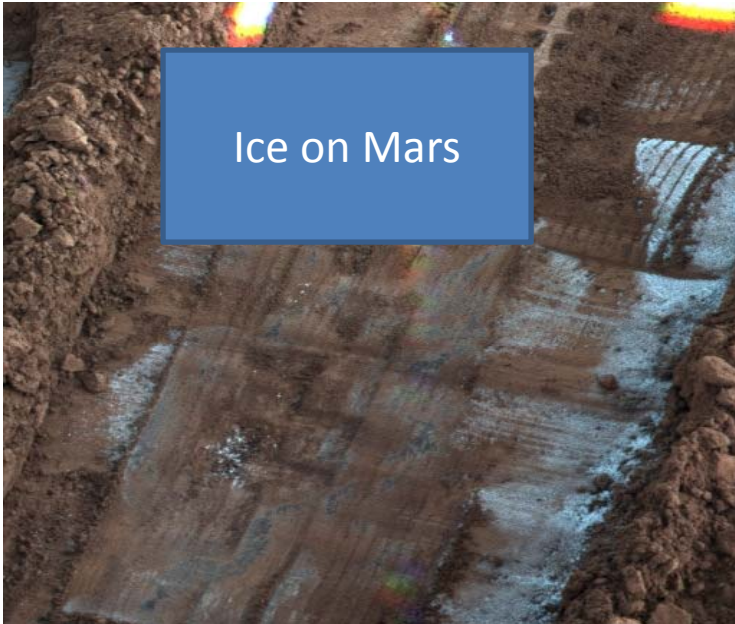
Acceptance vs. Adoption



Two Motivators



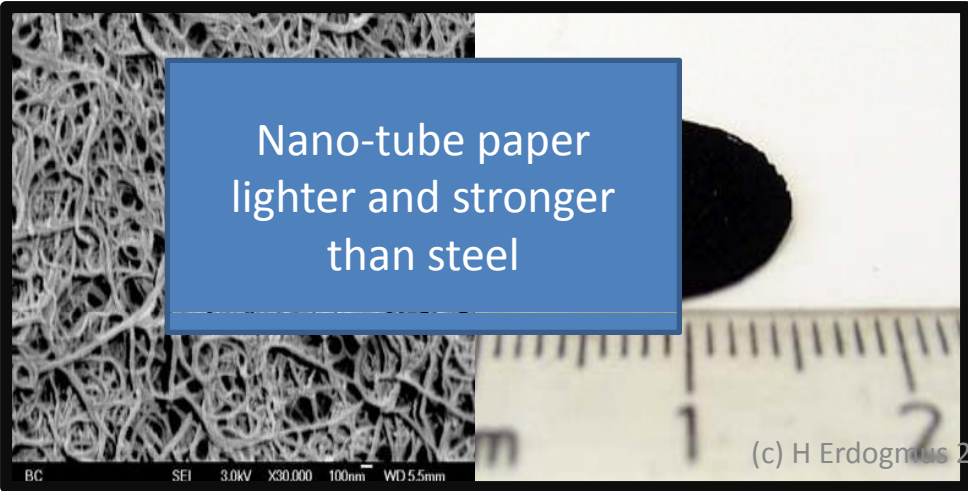
1. Kinds of Discoveries not often seen in SE



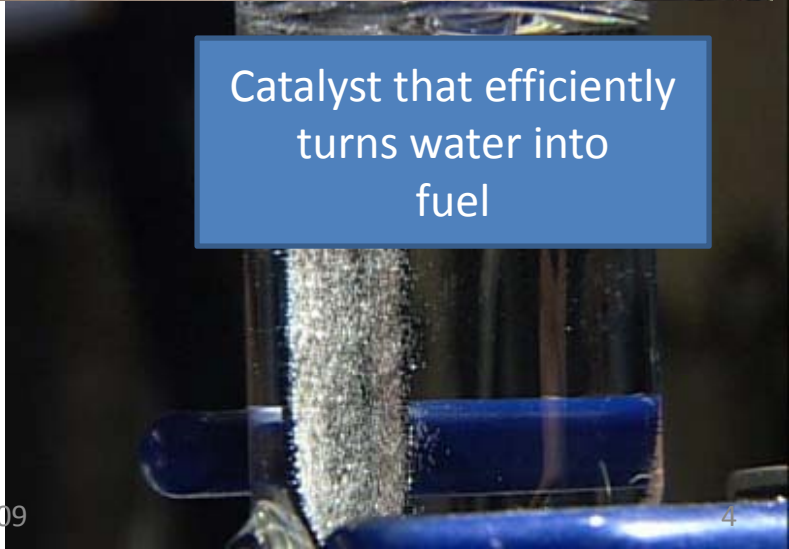
Ice on Mars



Supercomputer that breaks the petaflop barrier



Nano-tube paper lighter and stronger than steel



Catalyst that efficiently turns water into fuel

(c) H Erdogmus 2009

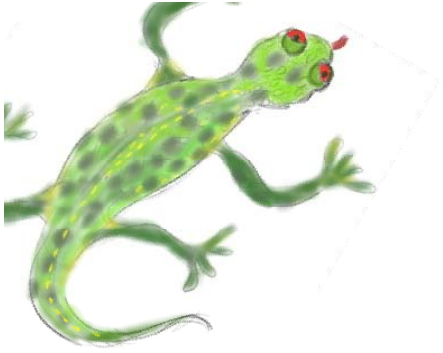


**Why don't step functions
occur as often as we'd like in SE?**



2. The end of software engineering?

- Tom DeMarco: “Software Engineering: An Idea Whose Time Has Come and Gone?”, IEEE Software, July/Aug 2009
- DeMarco questioning some of his legacy advice...
 - “You can’t control what you can’t measure...”
 - Emphasis on planning, measurement, quality, control



**Why did DeMarco equate SE
with SE process?**



Software Engineering

- Using systematic *means* to build software with the goal of improving efficiency
 - ***Better and more sustainable product with***
 - ***Cheaper means***
 - ***Faster means***
 - ***More sustainable means***
- SE research: discovery of such means



***Means* = Technology**

+ Maxims

+ Methods

+ Practices



Process?

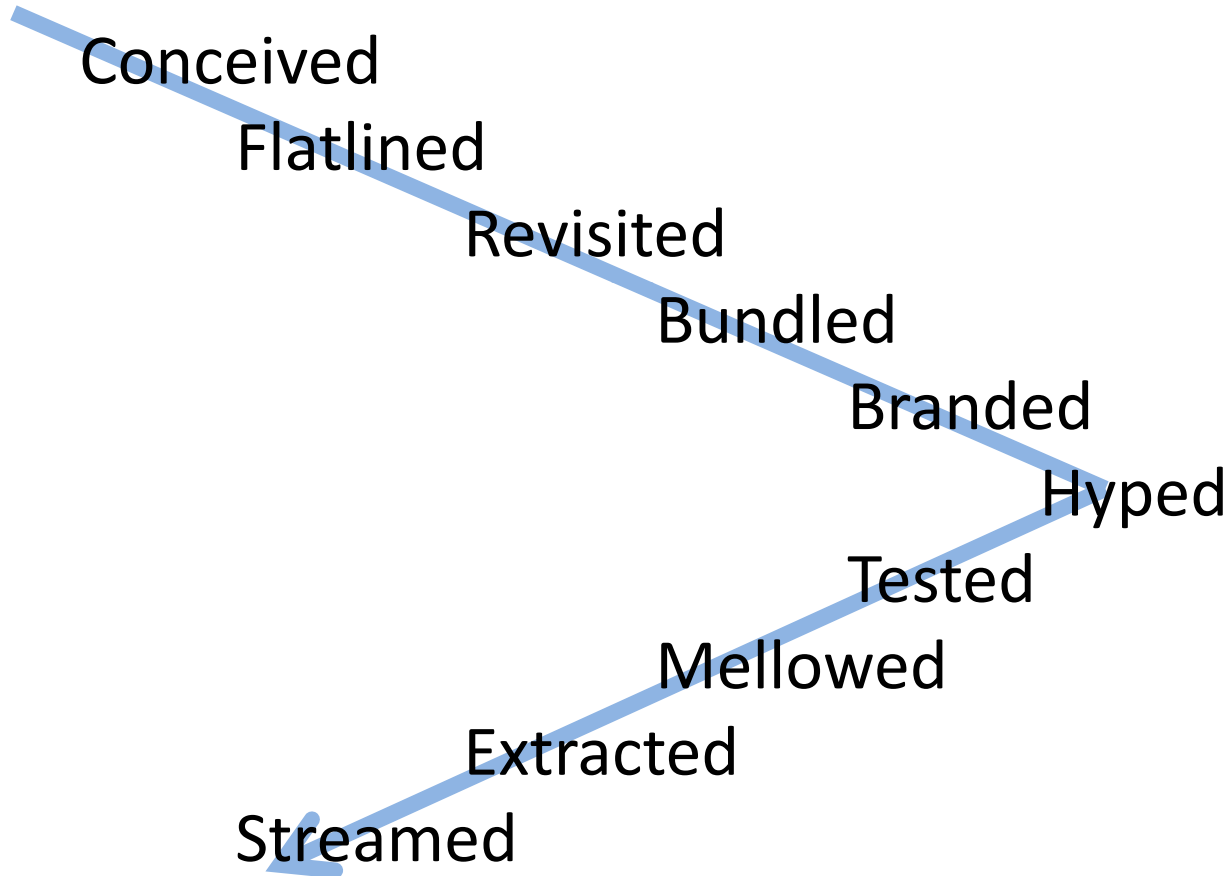


Is Modern SE Research Naturally Incremental and Evolutionary?

- The four essential difficulties (Brooks):
 - *Complexity*
 - *Conformity*
 - *Changeability*
 - *Invisibility*
- Key ideas have been around for a long time
 - *Abstraction*
 - *Modularity and information hiding*
 - *Reuse*
 - *Communication*



SE Idea Cycle





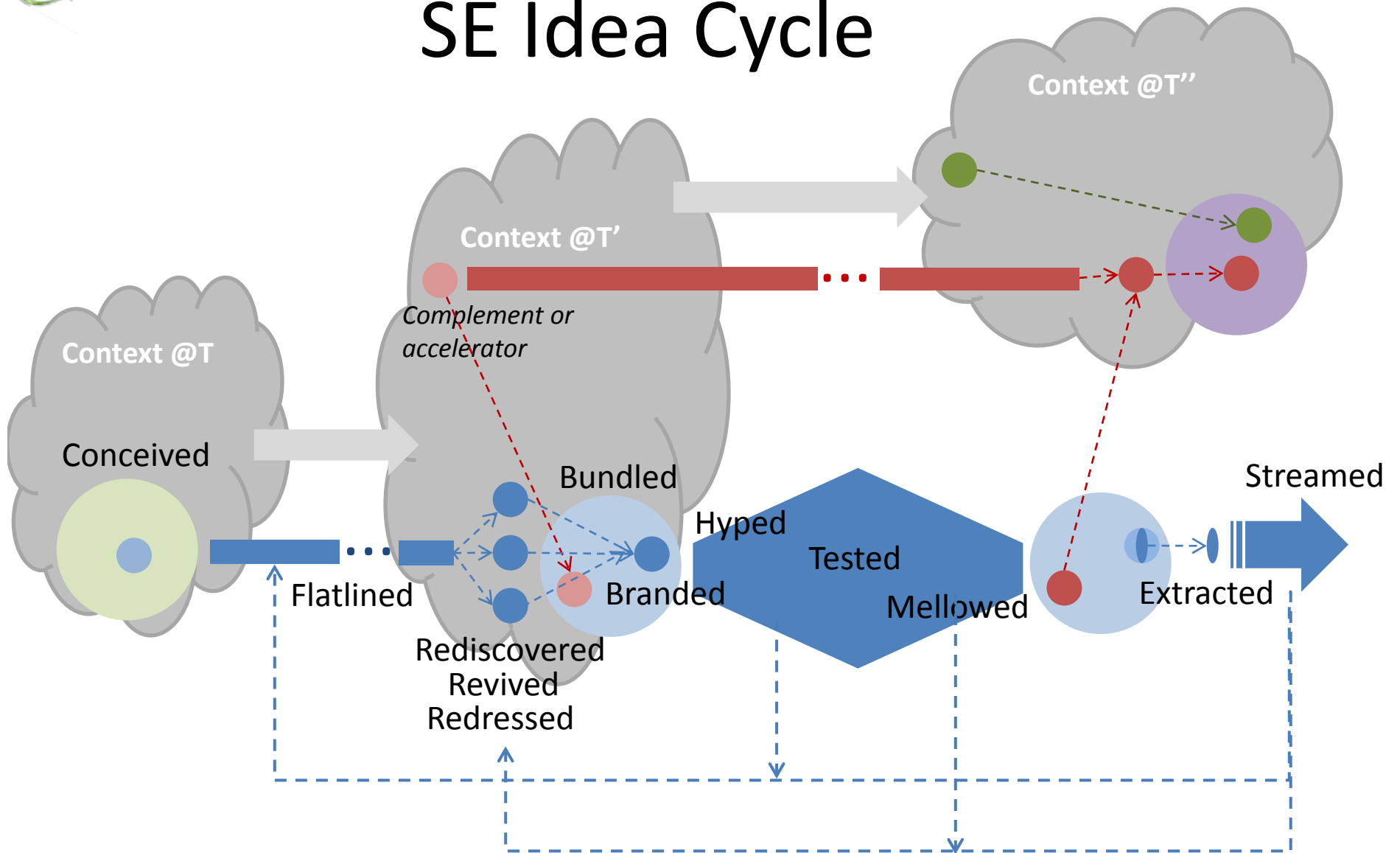
Assumption

Idea has merit





SE Idea Cycle





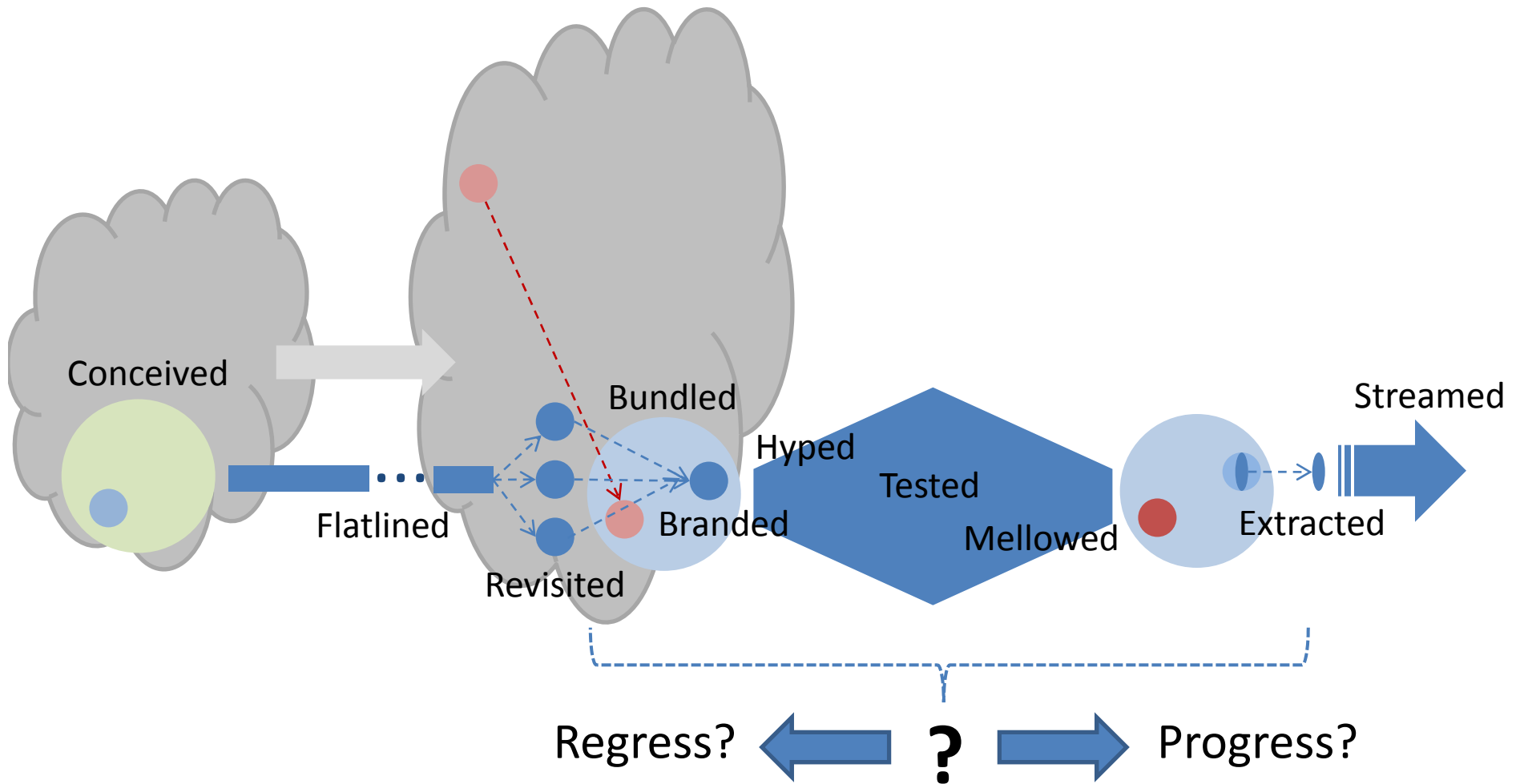
SE research is not only incremental and evolutionary, but it's also

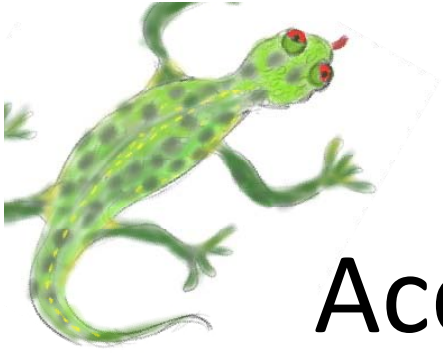
iterative and threaded...

ideas are repeatedly revisited, re-bundled, spun off, and move across pipelines...



Levers?





Acceptance and Adoptability Levers

unbiased *Reflection*

neat *Bundling*

effective *Branding*

timely *Extraction*



Branding

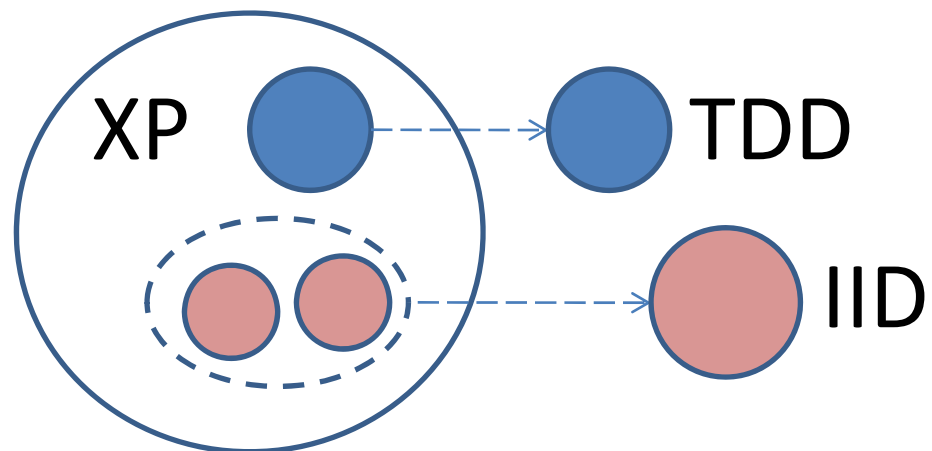
- Representative vocabulary aligned with the context
- Rational positioning
 - Part of good communication
 - Effective for targeting to a specific audience
 - *Not mindless jargon*



(Re-)Extraction

Spinning off an idea from a bundle:

- *As is*
- *In a distilled form*
- *In a more concrete form*
- *In a more generalized form*





Context and Bundle

- **Context** *the general environment in which an idea is positioned*
 - problems being addressed
 - related ideas
 - counter ideas
 - accelerators and decelerators
 - receptors, users, target audience
 - surrounding technologies (established and emerging)
 - technical, social, and economic conditions/constraints

- **Bundle** *the immediate context deemed necessary...*
 - to make an idea operationally viable
 - apply the idea in practice

Vital complementary ideas, concepts, approaches, processes, methods, technologies, standards, ...all the things the proponents stipulate that will make the idea work in practice



Idea vs. Bundle

Distinction is a matter of granularity and abstraction level:

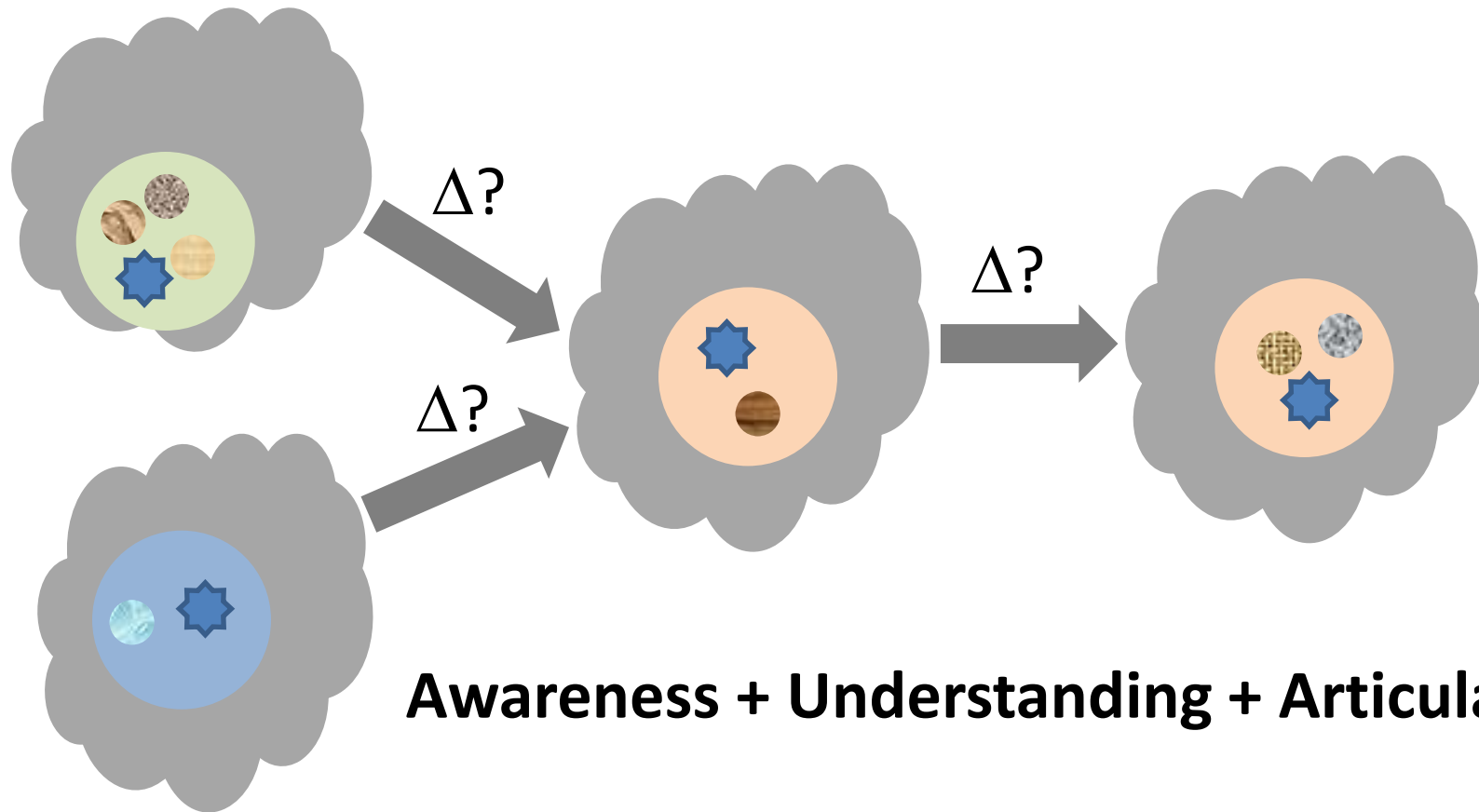
Idea *the phenomenon being examined*

Bundle *its immediate context and packaging*



Unbiased Reflection

Objective evaluation of the *pedigree* relative to the current context





Questions for Unbiased Reflection

- How does the current context differ from those of the pedigree? What has changed in the environment?
- How does the current bundling differ from those of the pedigree?
- How successful were the incarnations in the pedigree?
- How successful were any of the counter ideas under specific circumstances? (*Evidence?*)
- Why haven't the previous incarnations taken off?
- In what ways is the current bundling advantageous?
- In what ways is the current bundling disadvantageous?



Why Unbiased Reflection?



Learning to avoid

Recurring traps

Reversible mellowing

Pendulum swings

Better branding





Biased Reflection

False differentiation

Works!

False association

Works even better!

Context vs. Bundle

Context

- Large
- Elements may have many degrees of separation
- Not necessarily cohesive
- *Messy*

Bundle

- Small
- Elements have a few degrees (single degree?) of separation
- Cohesive
- *Neat*



Adoptability Barrier Conjecture

A means for solving a problem should be “simpler” than the problem it’s trying to solve

The total effort required to understand, learn, and apply the means must be lower than the total effort required to solve the expected instances of the problem by the alternative or *de facto* means

Assumption: no side effects = benefits are invariant

$$\begin{aligned} & \text{LearningCost}[\text{New}] + N \times \text{ApplicationCost}[\text{New}] \\ & < N \times \text{ApplicationCost}[\text{Old}] \end{aligned}$$

Low *ApplicationCost*[New] and **Large** *N*

⇒ **High** *LearningCost*[New] amortized over time



Forces Raising the Adoptability Barrier

- Prevent amortization through recurring learning cost
 - Changing technology
 - Turnover
- Voids amortization guarantee
 - Uncertainty in expected number of instances



Neat Bundle

Internally

- **Small:** few elements
- **Cohesive:** closely related, highly mutually synergistic elements
- **Essential:** low redundancy
- **Loosely coupled:** elements can be understood and applied independently, with minimal reliance on each other (reliance \neq relatedness)

Externally

- **Loosely coupled:** few dependencies on the context



Marketability vs. Adoptability



- Marketability favours:

- Messy bundles: everything but the kitchen sink

This problem is so complex and we're so smart, we're the only ones who can pull it off...

- Adoptability (Barrier Conjecture) favours:

- Neat bundles

*Neat bundles may be perceived as simple-minded!
As bundles get bigger, they also get messier!*



What about Evidence?



Necessary in SE for adoption?

Depends on the idea, context, risk-taking preference and tolerance of the receptor and type of evidence...

- **Feasibility** evaluation: *can be done early*
- **Anecdotal** evidence: *gathered beginning with the “Tested” stage*
- **Systematic** evidence: *not available before well into the “Streamed” stage*

	Feasibility	Anecdotal	Systematic
For a viral idea (in small bundle)	?	NO	NO
Before exposing an idea	YES	NO	NO
For rapid small-scale adoption	YES	YES	NO
For gradual large-scale adoption	YES	YES	?
For rapid large-scale adoption	YES	YES	YES

In SE research, evidence is over-emphasized, emphasized too early and indiscriminately

Bundle	Central Ideas	Neatness	Reflection	Branding	Extraction	Stage/ Evidence
SOA	Software as a service	Messy	?	Ok	Web services	Hyped/ ?
MDA	Abstraction HE1	Messy	Poor	Poor	xUML	Hyped- Tested/ Anecdotal
BDD	TDD	Ok	Ok	Good	Ruby BDD	Tested- Mellowed /?
Scrum	IID	Neat	Poor	Good		Streamed/ Anecdotal - Systematic
AOP HE2	Separation of concerns	Neat	Good	Good		Streamed/ ?
PBR	Software inspections	Neat	Good	Poor		Flatlined/ Systematic

Slide 31

- HE1** Tim objected to this: research what the central ideas are for MDA, check with expert
Hakan Erdogan, 01/11/2009
- HE2** Check with an expert
Hakan Erdogan, 01/11/2009



SE idea cycle levers constitute neither sufficient nor necessary conditions for acceptance and adoption!



**Don't expect big ideas with big impact!
Or accept that they will be rare at best...**

*New software development
technique increases
productivity
instantly by tenfold!*



Food for Thought: *Where is your favourite trend headed?*

Domain Specificity

Cloud Computing

Agile Software Development

Software Product Lines

Kanban Systems

Multi-Core Programming

Multi-Paradigm Programming

⋮





Hakan.Erdogmus@kalemun.com

<http://thingssoftware.com>