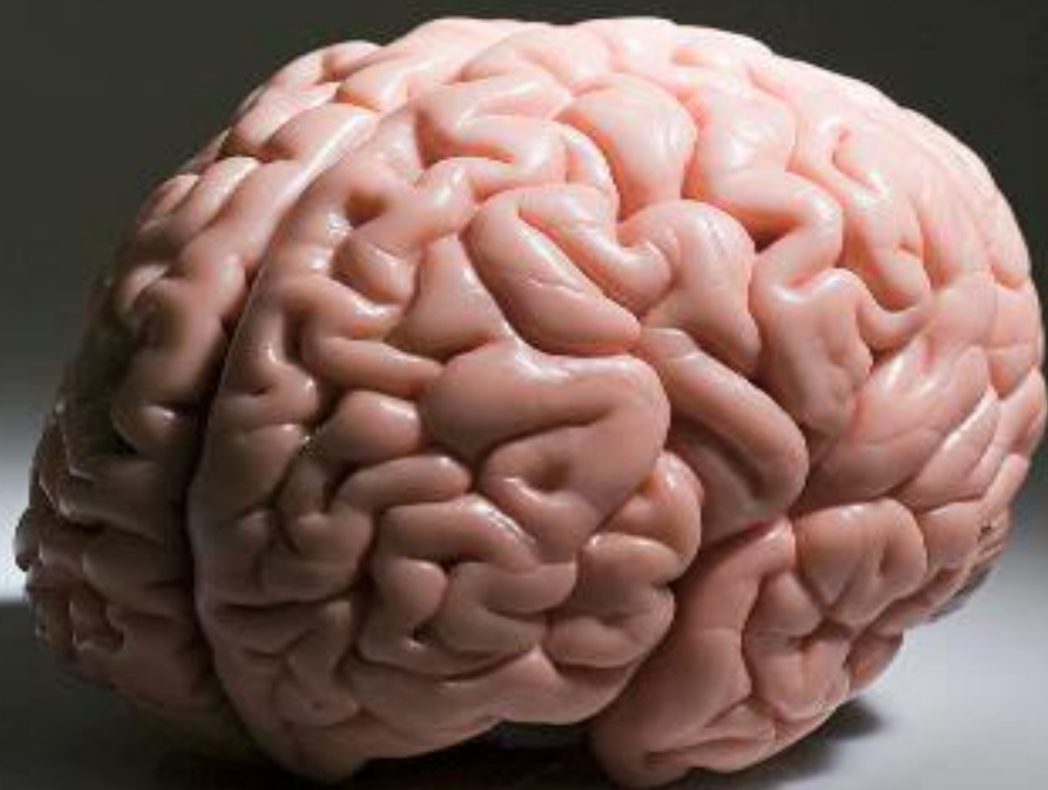


# The Semantic Web and Collective Intelligence

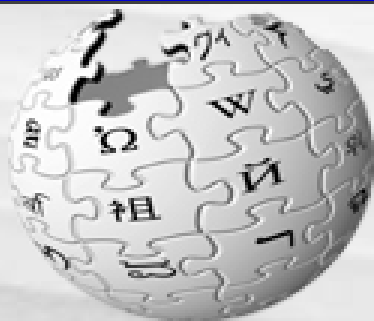
Thomas W. Malone

*MIT Center for Collective Intelligence*









**WIKIPEDIA**  
*The Free Encyclopedia*

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## Welcome to Wikipedia,

the free encyclopedia that anyone can edit.

3,167,466 articles in English

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### navigation

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- [Random article](#)

### search

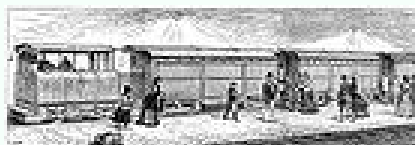
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### interaction

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### Today's featured article



The **City and South London Railway** was the first deep-level

underground "tube" railway in the world, and the first major railway to use electric traction. Originally intended for cable-hauled trains, the collapse of the cable contractor while the railway was under construction forced a change to electric traction, an experimental technology at the time, before the line opened. When opened in 1890, it had six stations and ran for 3.2 miles (5.1 km) in a pair of tunnels between the City of London and Stockwell, passing under the River Thames. The diameter

### In the news

- More than 200 people are killed during several days of **rioting** between **Muslims** and **Christians** in **Jos**, **Nigeria**.
- A strong **aftershock** measuring **5.9 M<sub>w</sub>** strikes **Haiti** one week after an **earthquake** that killed more than 70,000 people and caused widespread destruction in **Port-au-Prince**.
- Republican **Scott Brown** (*pictured*) wins the **special senatorial**



# The Question

How can people and computers  
be connected so that  
— collectively —  
they act more intelligently  
than any person, group, or computer  
has ever done before?

# Traditional Semantic Web answer

- Represent the *data*...
- ... in ways computers can understand
- ...then let *computers* do (more of) the processing.

# Why can't we also ...

- Represent the *processes*...
- ... in ways both people and computers can understand
- ... then let people and computers *share* the processing in flexible ways

## In other words...

We need shared ontologies that:

- Represent *verbs*, not just *nouns*, and
- Are *semi-formal*, not just *formal*

# Two examples

- Process Handbook
- Genomes of collective intelligence

# The MIT Process Handbook Project

- Thomas Malone
- Chris Dellarocas
- Abraham Bernstein
- Kevin Crowston
- George Wyner
- George Herman
- Jintae Lee
- John Quimby
- Mark Klein
- Brian Pentland
- Charley Osborne
- Elissa O' Donnell
- And many others...

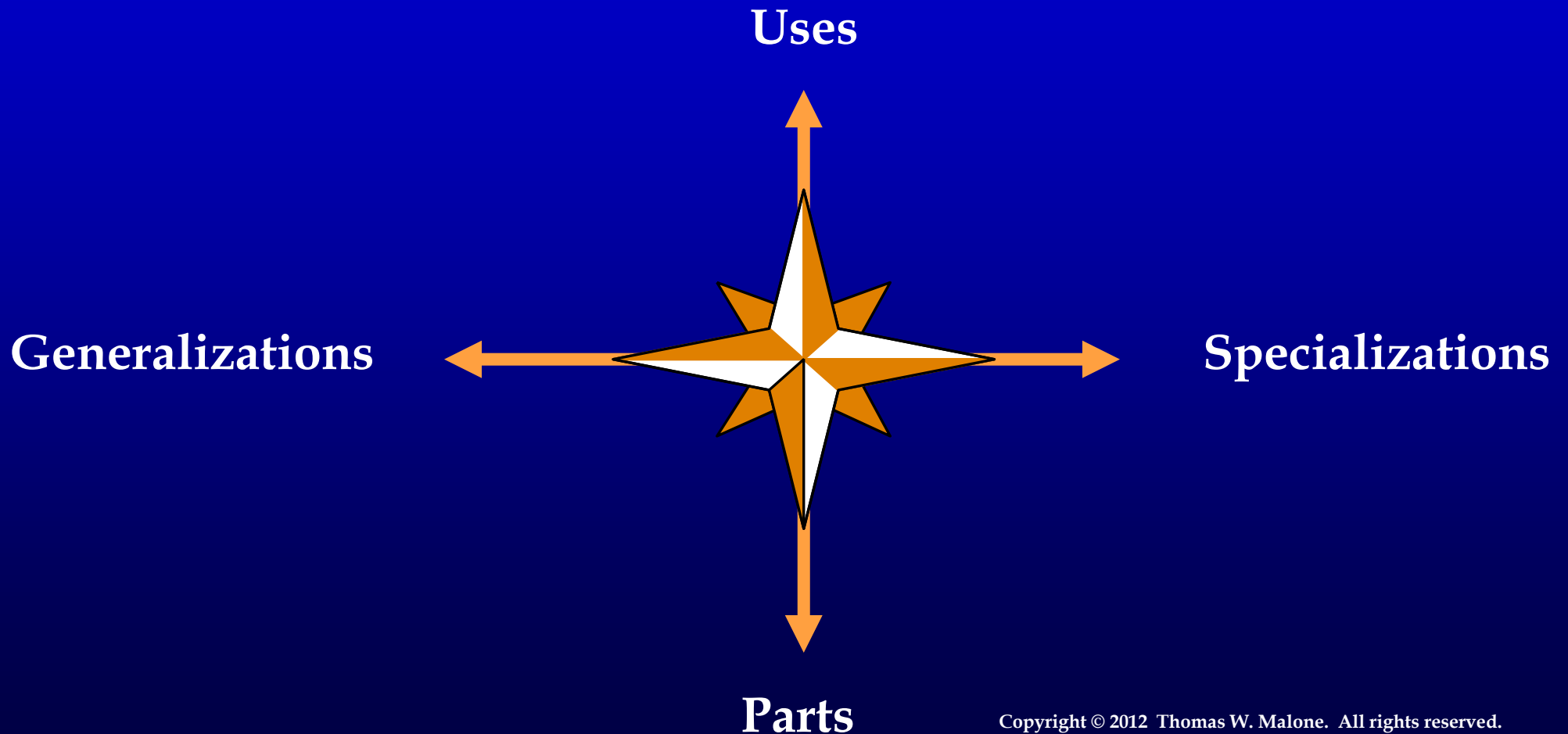
# MIT Process Handbook

- **Process theory**
  - Specialization and inheritance
  - Coordination and dependencies
- **Software**
  - Repository engine
  - Web server
  - Editing tools
- **Business content**
  - Over 5000 processes and activities
  - Generic business models
  - Taxonomy of generic activity types
  - Case examples

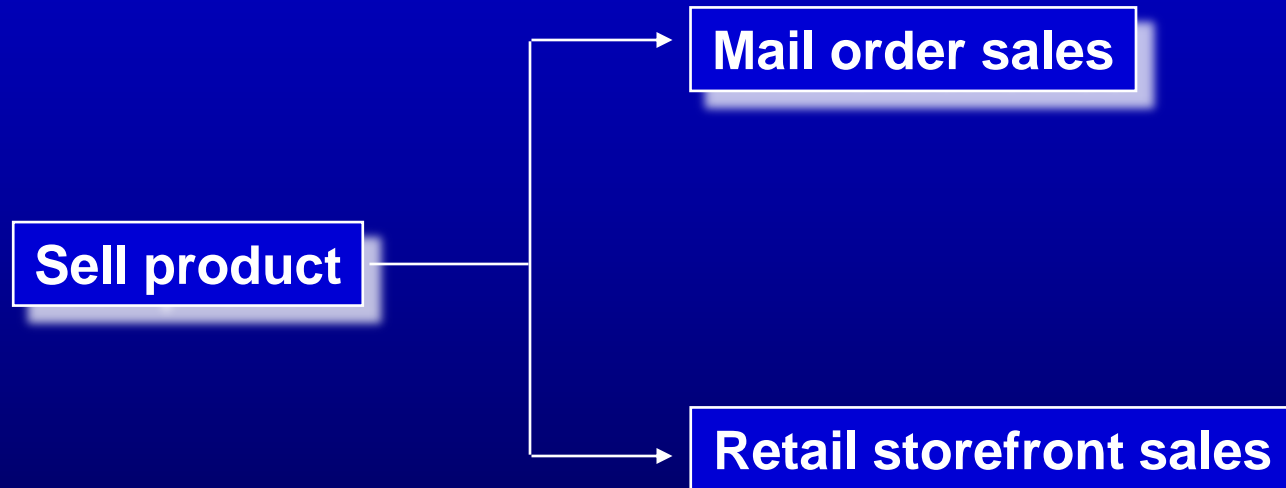
# MIT Process Handbook (cont.)

- Based on MIT research approximately 1992 - 2004
- Open source version available
- See:
  - Malone, Crowston, Herman (Eds.), *Organizing Business Knowledge: The MIT Process Handbook*, MIT Press, 2003.
  - <http://ccs.mit.edu/ph>

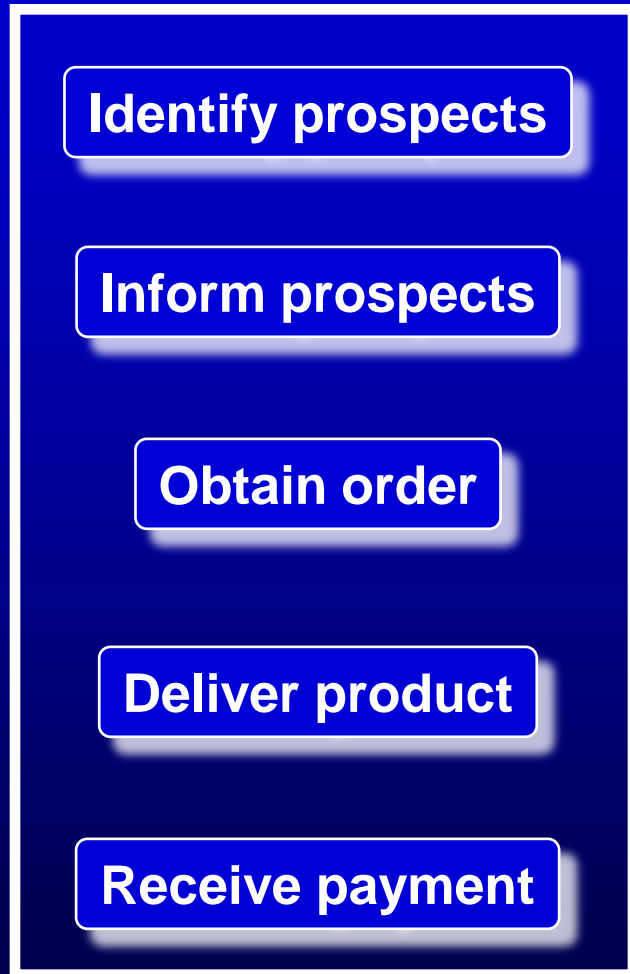
# The Process Compass



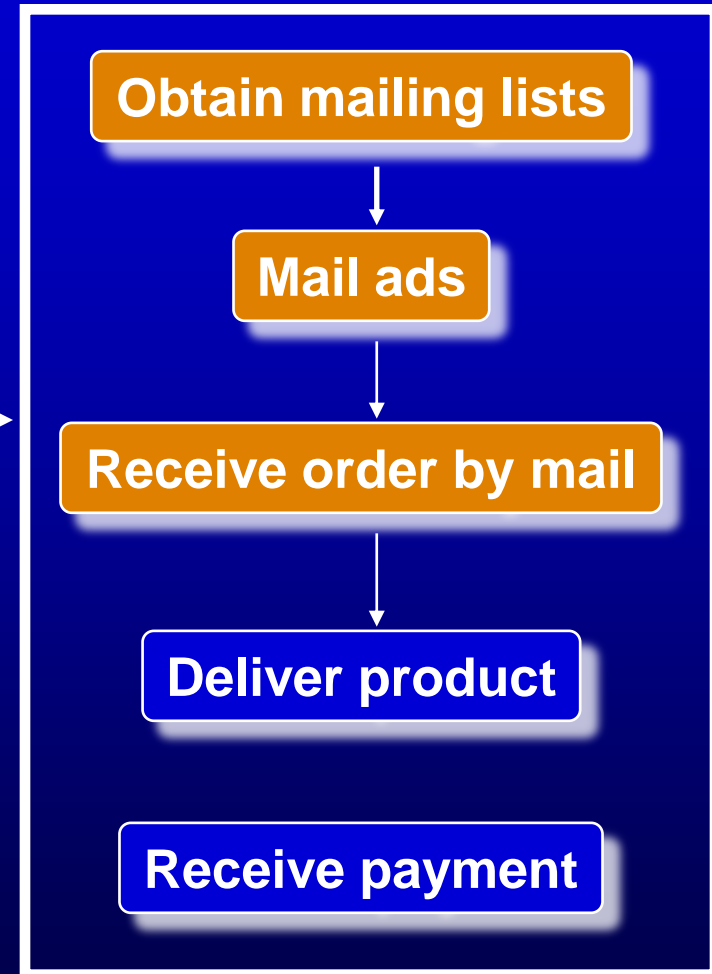
# Specialization of processes



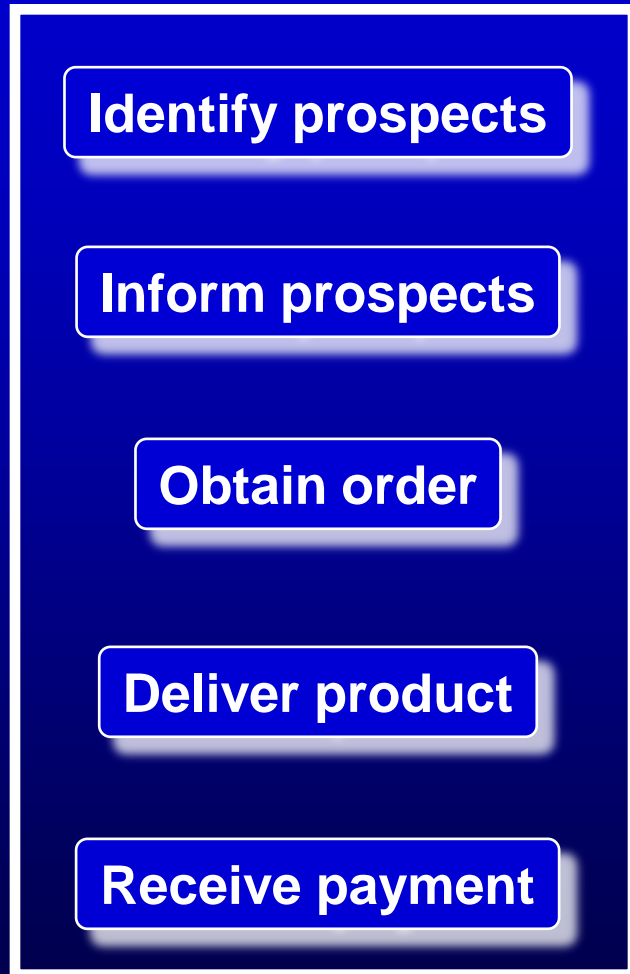
# Sell product



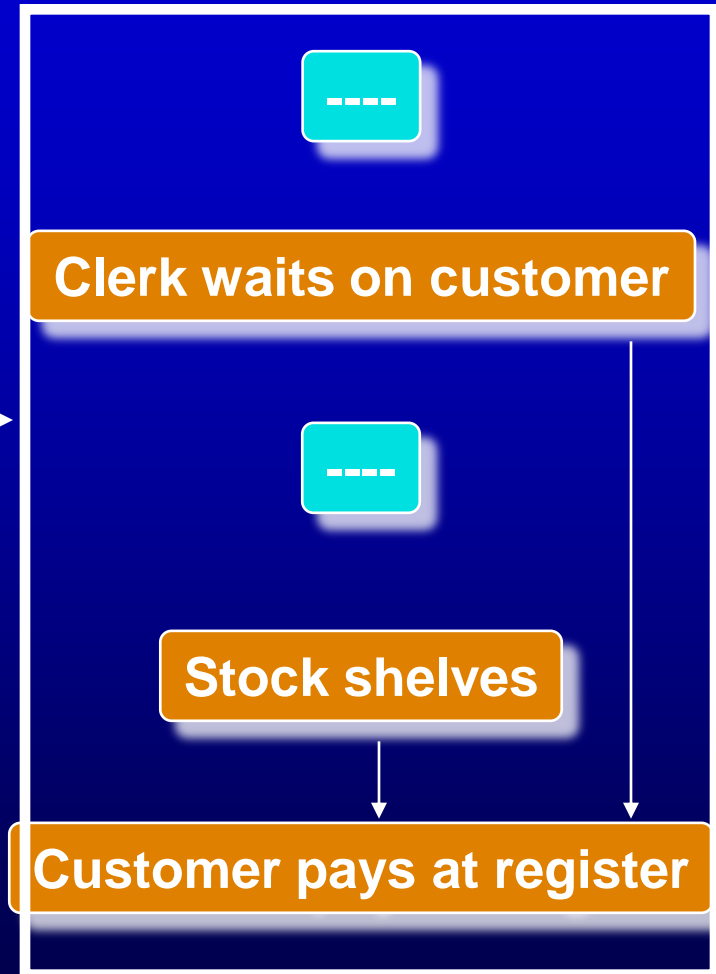
# Mail order sales



# Sell product



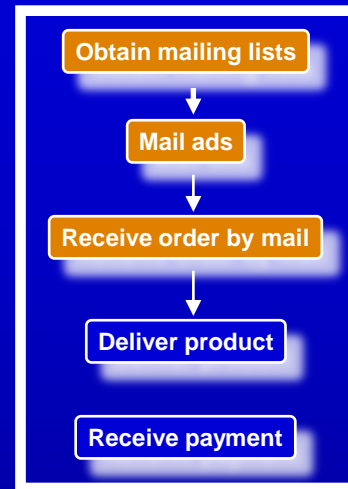
# Retail store sales



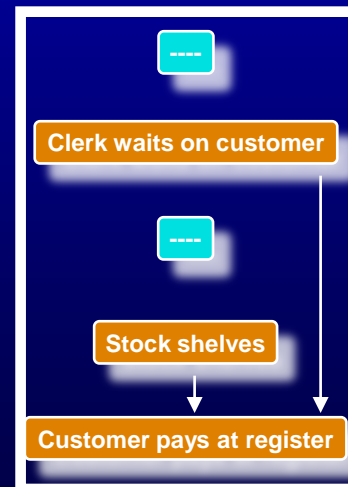
## Sell product



## Mail order sales



## Retail store sales



# How to categorize all business activities?

- All activities in the knowledge base are organized in a web of increasingly specialized *types* of activities.
- The most general activity of all is called “Act”.
- The next level of classification contains 8 “generic verbs” (and one “unclassified” category).


# The “generic verbs”

- Create
- Modify
- Preserve
- Destroy
- Combine
- Separate
- Decide
- Manage
- Unclassified

Process: Act - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites History

 **The MIT eBusiness Process Handbook**  
Monday, January 22, 2001








[Home](#)  
[Directory](#)  
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[History](#)  
  
[Profile](#)  
[Logout](#)

**Act**

- [Back to Details](#)
- [Join the discussion](#)
- [Print this process](#)
- [Be notified of updates](#)
- [Find more information](#)

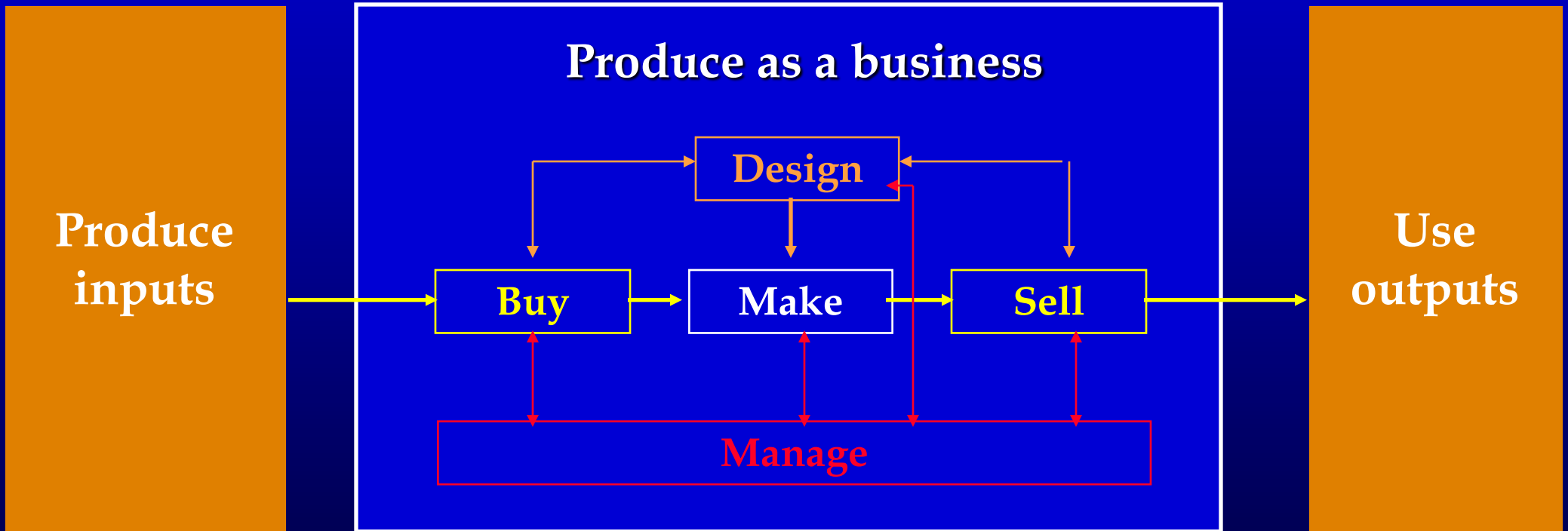
**Related Processes**

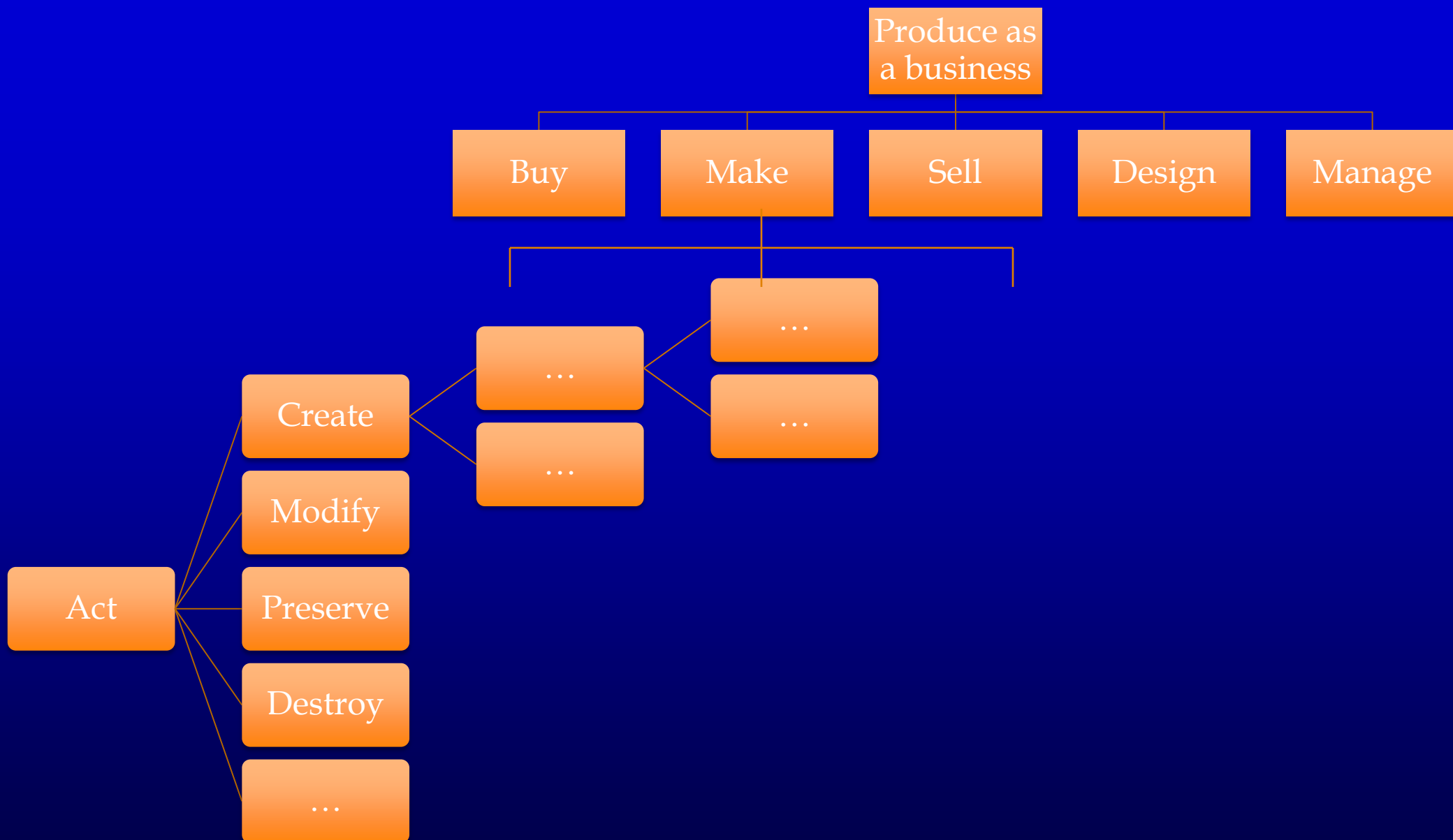
**Other ways Activity Root can be done**

- [Create](#)
  - Create how? 
    - [Forecast](#)
    - [Duplicate](#)
    - [Calculate](#)
    - [Perform](#)
    - [Develop](#)
    - [Build](#)
  - Create what? 
    - [Design](#)
    - [Make](#)
  - Create- views 
    - [Produce](#)
- [Modify](#)
  - Modify how? 
    - [Reduce](#)
    - [Evolve](#)
    - [Move](#)
    - [Process](#)
    - [Prepare](#)
    - [Improve](#)
  - Modify what? 
    - [Modify physical good](#)
    - [Modify information item](#)
  - Modify - views 
- [Preserve](#)
  - Process how? 

Internet

All activities in a real business are  
also *part* of “Produce as a business”





# What is coordination?

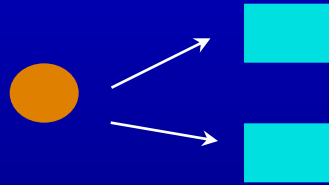
**Coordination --**

**Managing the dependencies among activities**

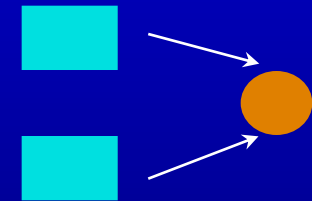
# Three elementary dependency types



Flow

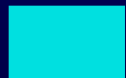


Sharing



Fit

Key:



Activity



Resource

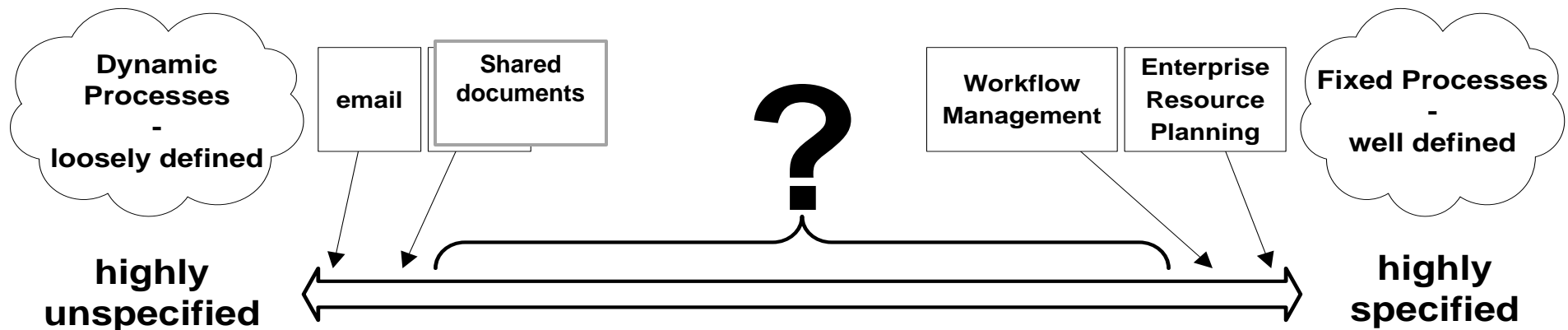
Dependency	Example Coordination Processes
<b>Flow</b>	
<b>Time</b>	Make to order vs. make to inventory (pull vs push)
<b>Place</b>	Transport vs. make at point of use
<b>Thing</b>	Ask customer vs. use standard
<b>Sharing</b>	First come/First serve, priority order, budgets, managerial decision, market-like bidding
<b>Fit</b>	Plan in advance (symphony) or let emerge (jazz)

# Integrating computational support for structured and unstructured processes

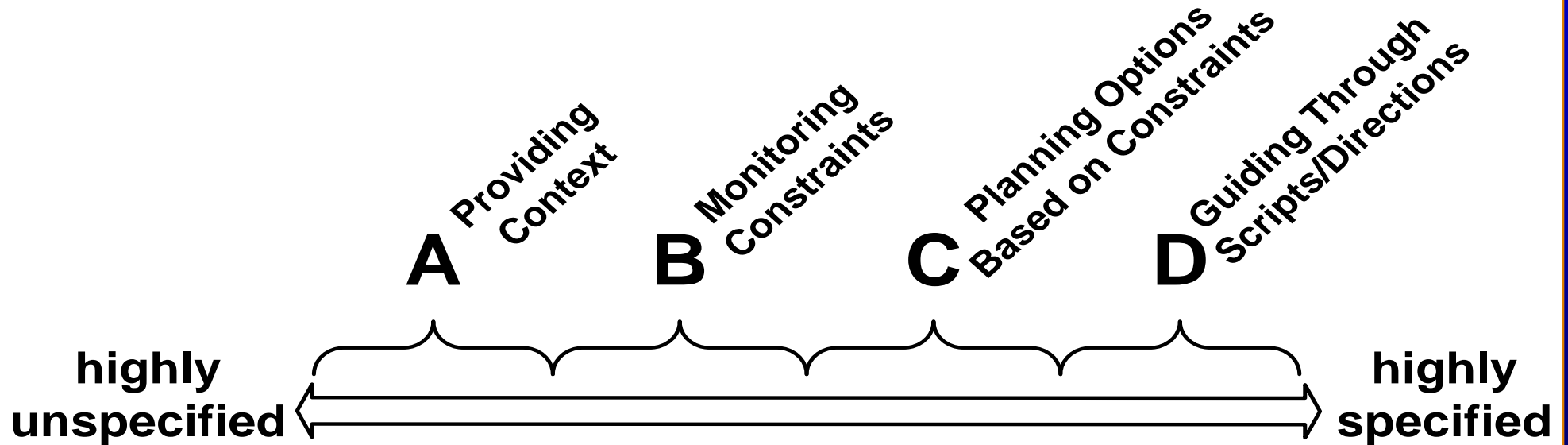
Work by:

Abraham Bernstein

# The specificity frontier



# Computational support along the specificity frontier



# A process repository helps organize key knowledge needed

- Contexts
  - Including constraints, related information, and other resources
- Alternative ways of doing things
  - For planning options
- Detailed scripts
  - For well-specified processes

# Software Design and Generation

Work by:

Chris Dellarocas

# On-demand software design and configuration

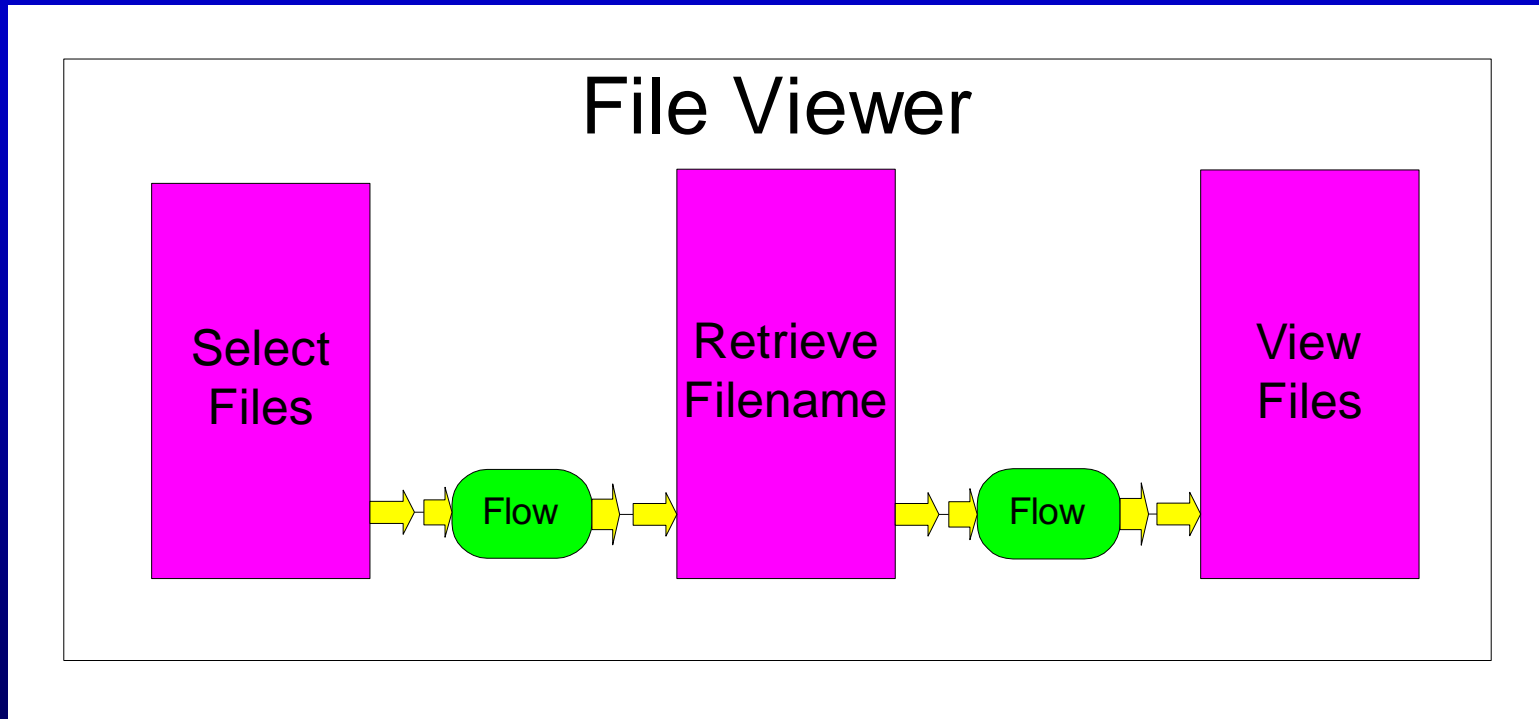
- Business users design a business process using repository
- Activities in repository include “hidden” information about needed software components (e.g., web services)
- Then (semi-)automatic process can select, tailor, and link software components to create application

# Example: SYNTHESIS software development environment

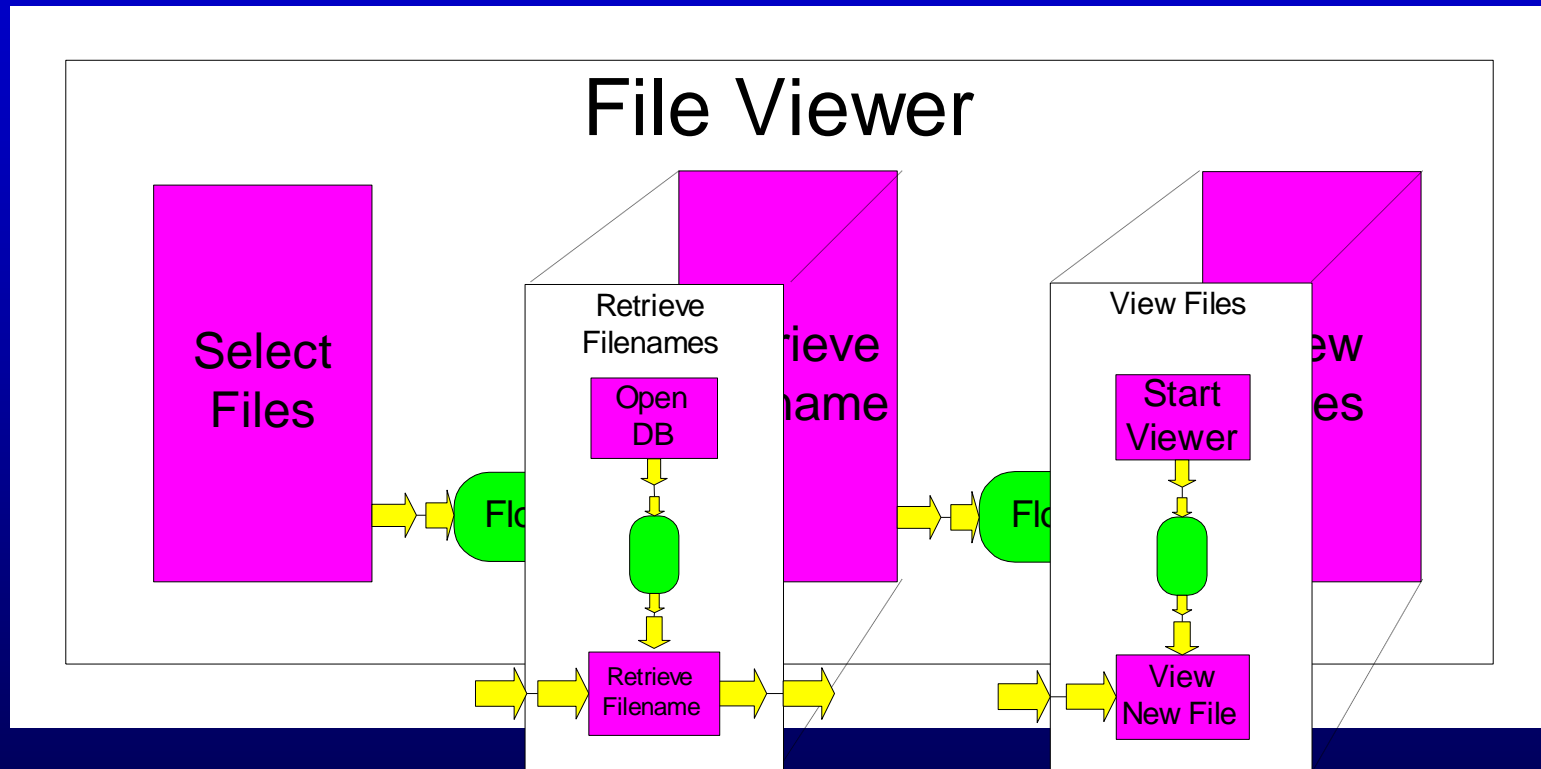
- Developed by Chrysanthos Dellarocas
  - MIT Ph.D. thesis, 1996
  - Several papers and patents
  - See:  
<http://www.rhsmith.umd.edu/faculty/cdell/synthesis.html>

# SYNTHESIS example:

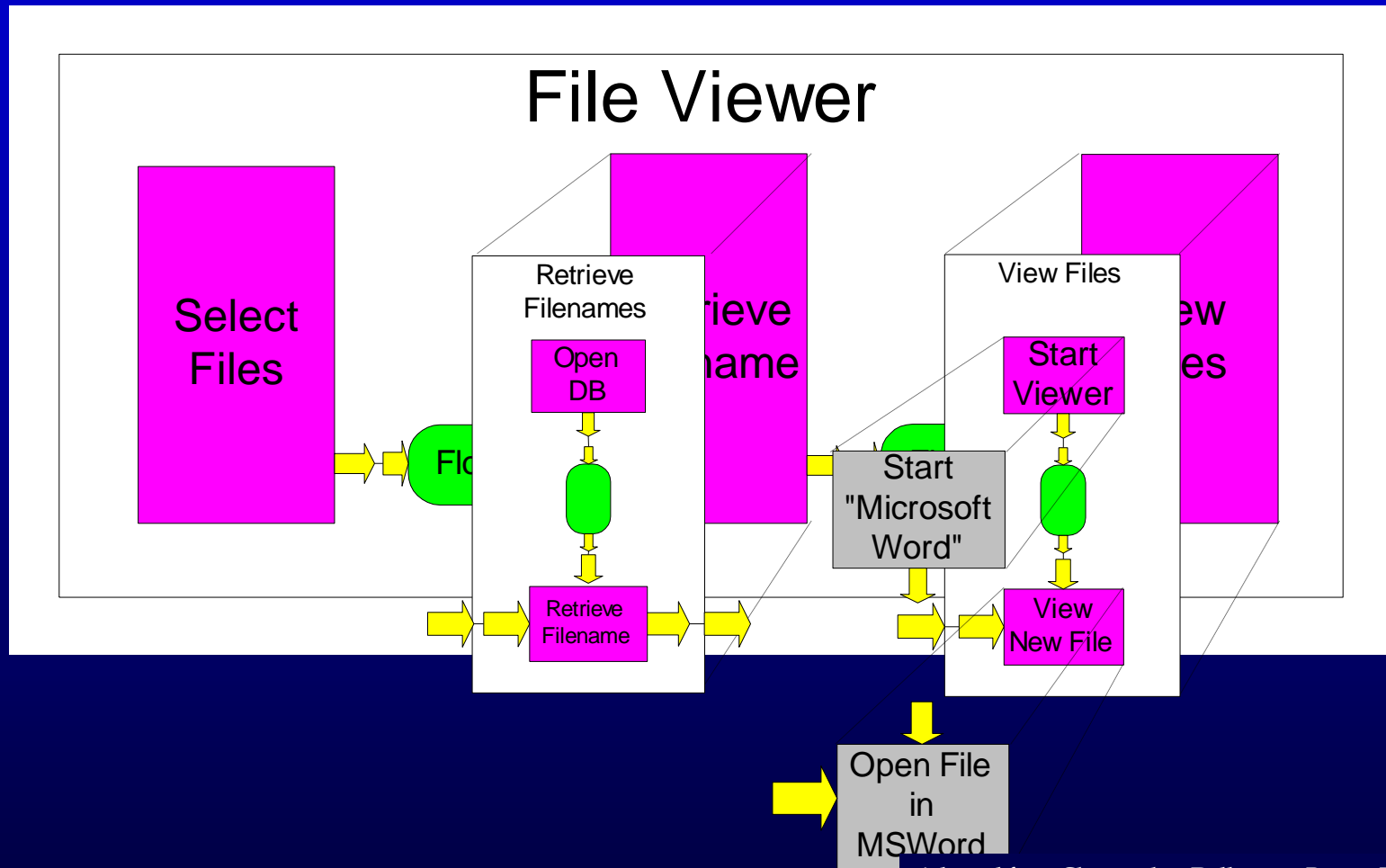
## 1. Create application description



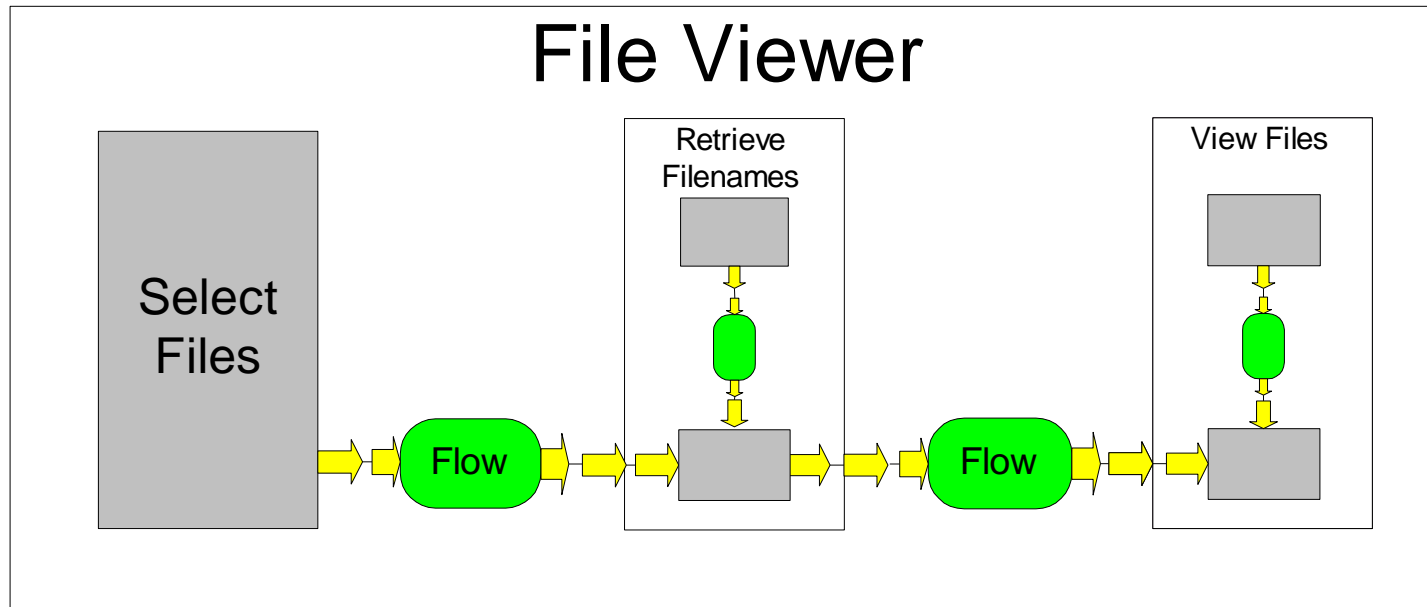
## 2. Specialize generic activities (a)



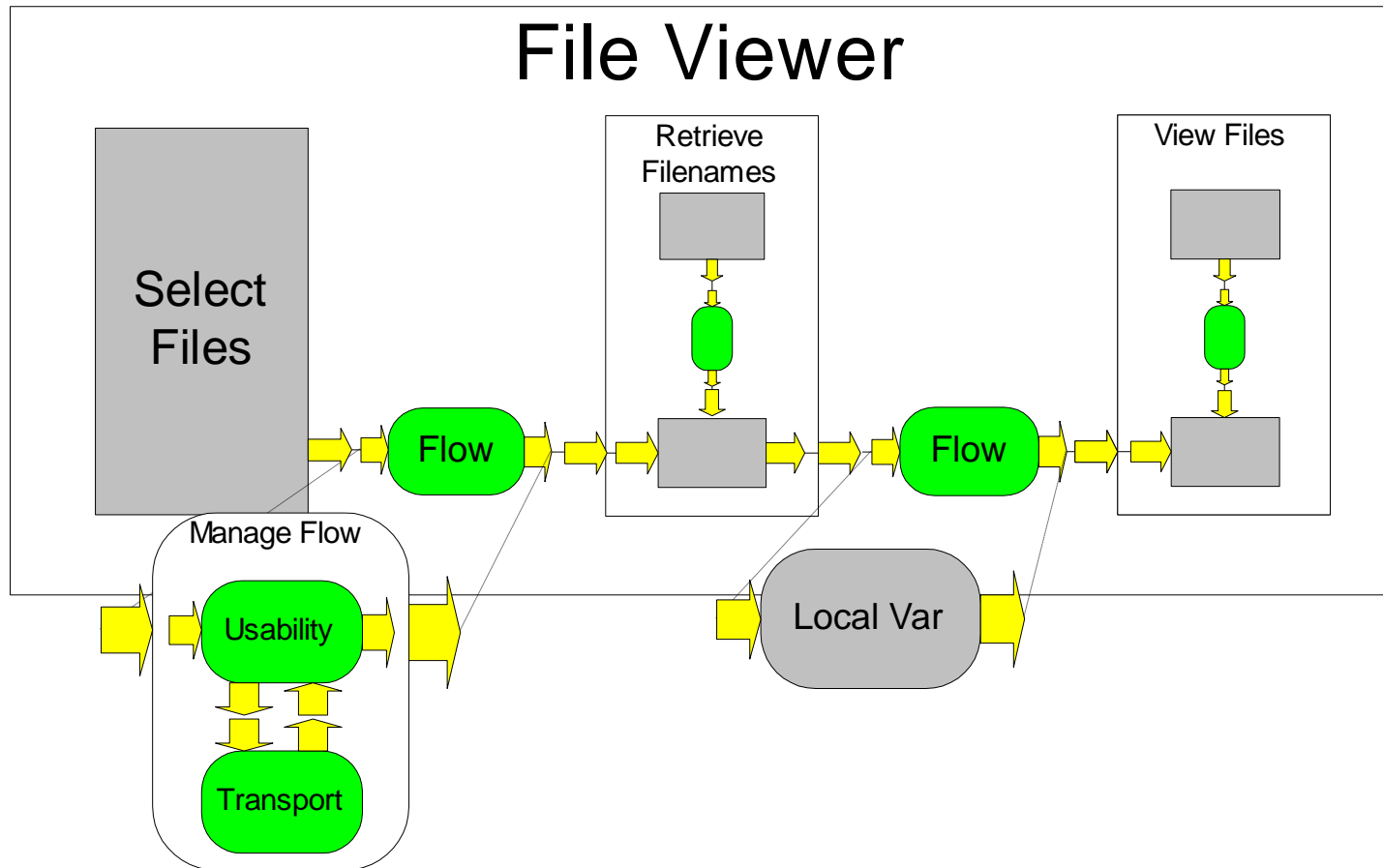
## 2. Specialize generic activities (b)



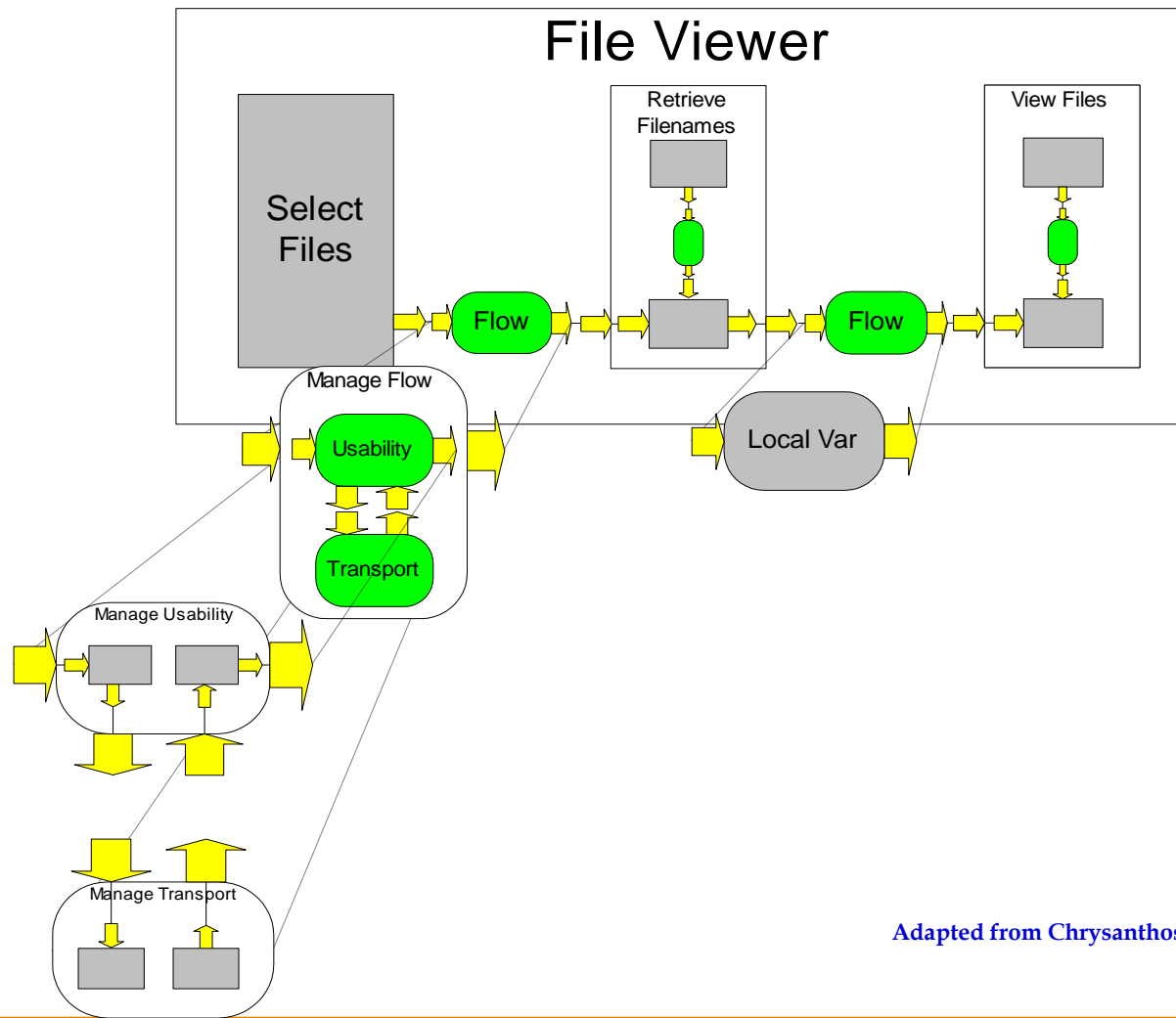
### 3. Manage dependencies (a)



### 3. Manage dependencies (b)

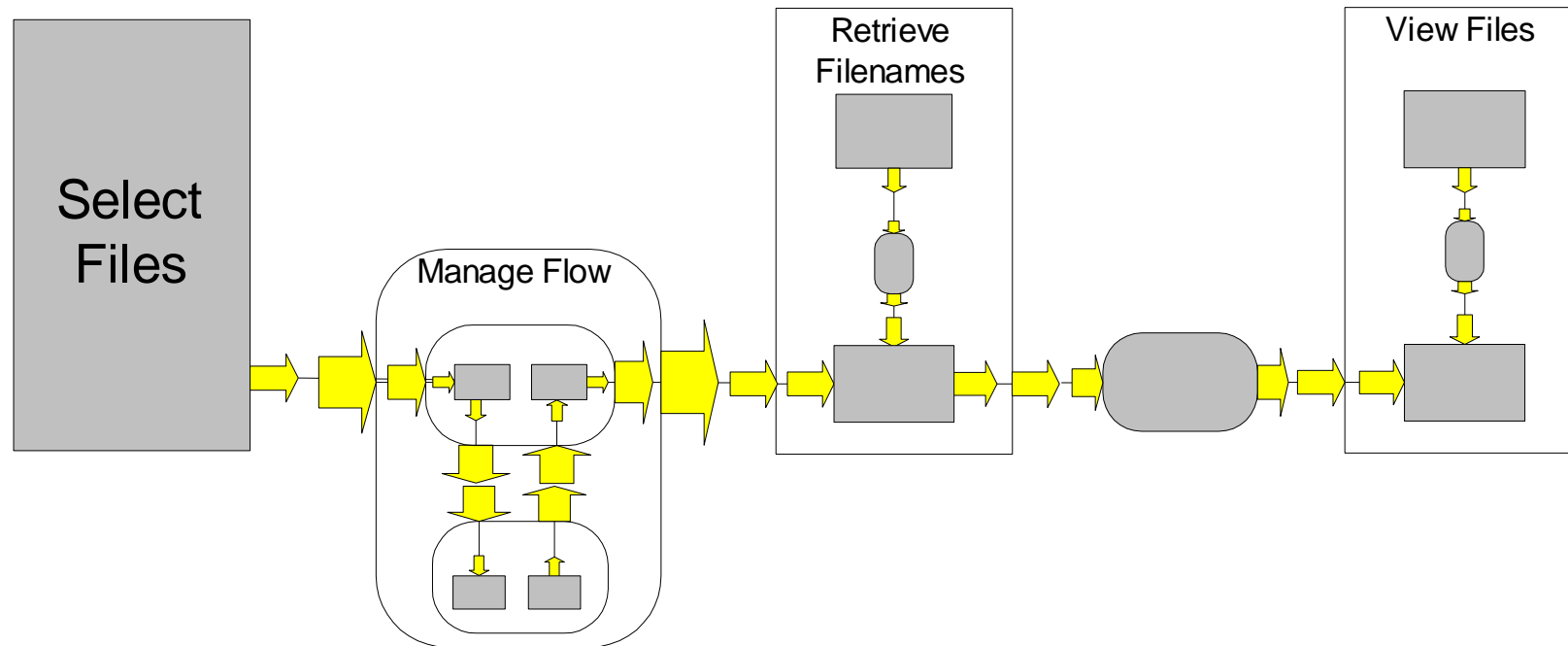


### 3. Manage dependencies (c)

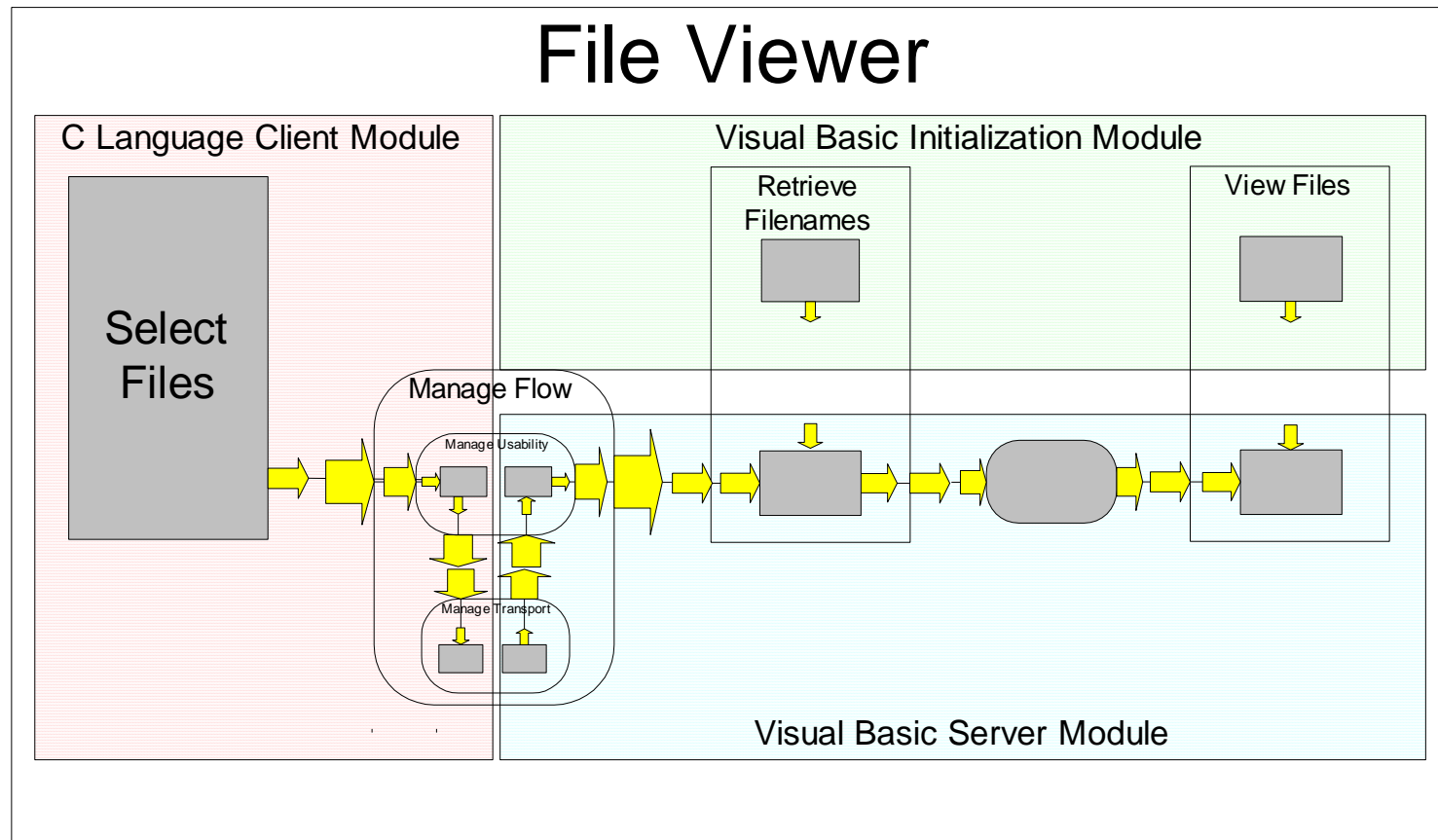


... until all elements are executable

## File Viewer



## 4. Integrate elements into modules (a)



## 4. Integrate elements into modules (b)

### File Viewer

#### C Language Client Module

```
main()
{
    select_files();
}

select_next_file(code)
{
    char s[20];
    itoa(s, code);
    dde_call(s);
}
```

#### Visual Basic Initialization Module

```
Sub Init()
    Init_DB
    Start_Exe "winword.exe"
End Sub
```

```
Sub DDE_Handler(s As String)
    code = CInt(s)
    filename = retrieve(code)
    Send_Keys "^O", filename
End Sub
```

#### Visual Basic Server Module

# Mapping the Genomes of Collective Intelligence

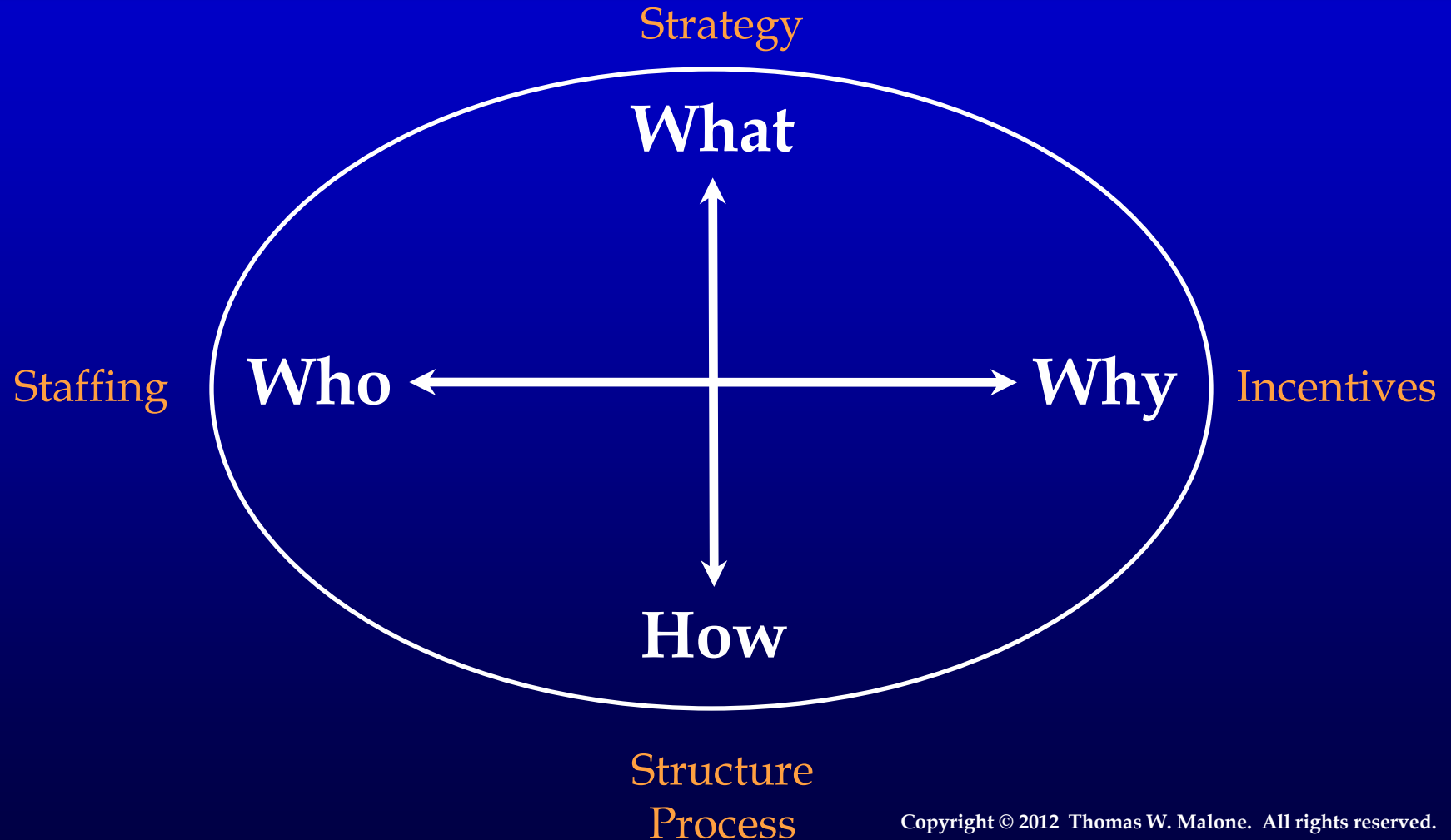
- Thomas Malone
- Rob Laubacher
- Chris Dellarocas

Malone, T. W., Laubacher, R., & Dellarocas, C. The Collective Intelligence Genome, *Sloan Management Review*, Spring 2010, 51, 3, 21-31.

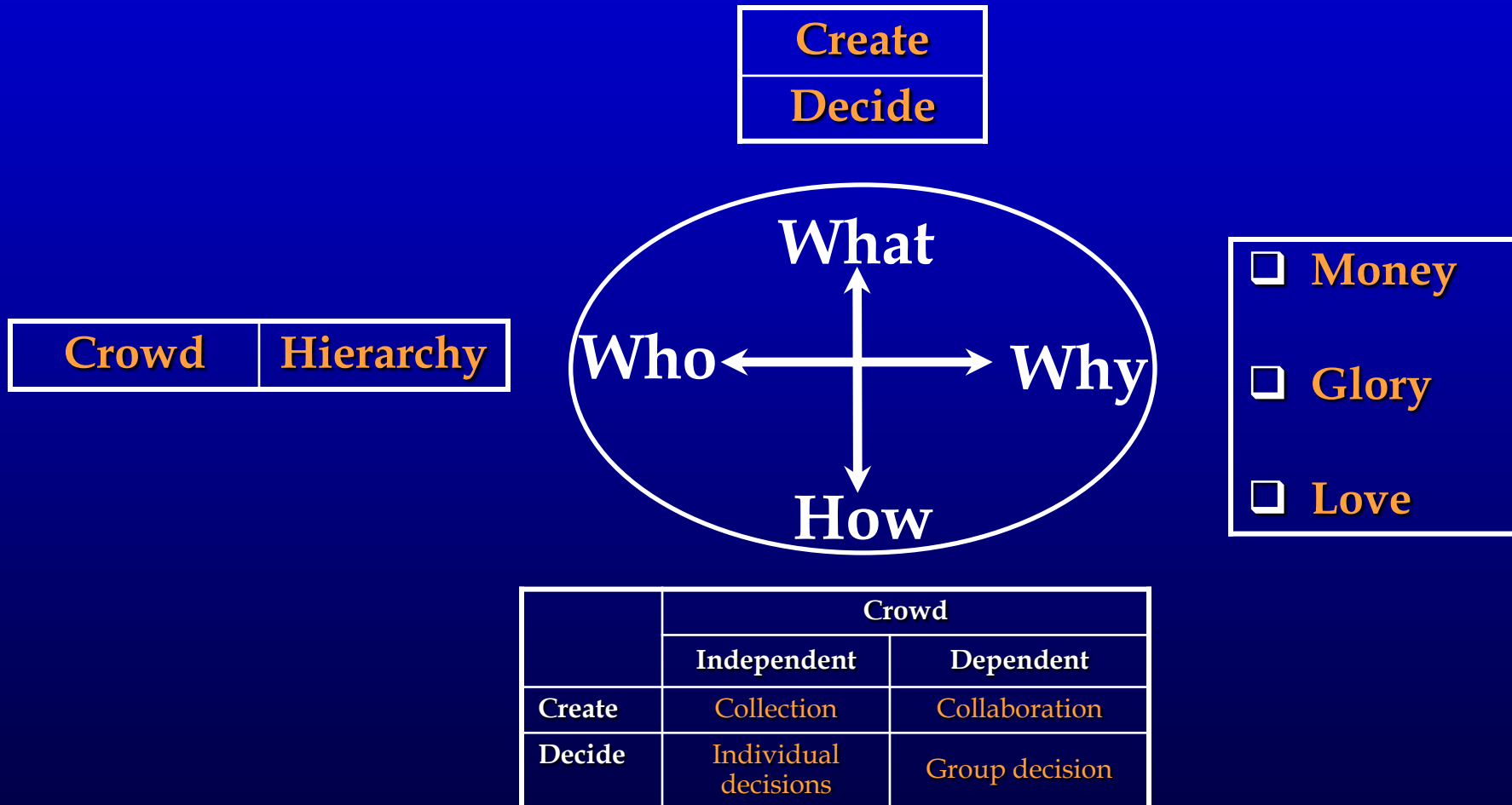
# What new kinds of collective intelligence processes do we see today?

- Different types of collective intelligence embody different design patterns.
- Let's call these design patterns “genes.”
- For each gene (and common combinations), we can map:
  - Examples
  - Situations where useful
  - Limitations
  - ...

# Every activity must have genes to answer four questions



# Types of organizational genes



# Example:

## Genetic structure of Linux

Example	What		Who	Why	How
Linux	Create	New software modules	Crowd	Love Glory	Collaboration
	Decide	Which modules warrant inclusion in next release	Torvalds and lieutenants	Love Glory	Hierarchy


# Who?

Who does the activity?

<b>Hierarchy</b>	One or a few people from a small, preselected group	Selecting modules for Linux
<b>Crowd</b>	Anyone who wants to in a large group	Editing Wikipedia

# Who?

Who does the activity?

<b>Hierarchy</b>	One or a few people from a small, preselected group	Selecting modules for Linux
 <b>Crowd</b>	Anyone who wants to in a large group	Editing Wikipedia

# When is the Crowd gene useful?

- The resources useful in solving the problem are distributed widely (or in unknown places).
- The problem can be divided into pieces such that:
  - Single individuals can do the pieces.
  - Enough individuals can be found and are (or can be) sufficiently motivated to participate.
  - The current owners of necessary information are willing to share it with the “crowd.”
  - Gaming and sabotage can be managed satisfactorily.
  - ...

# Why?

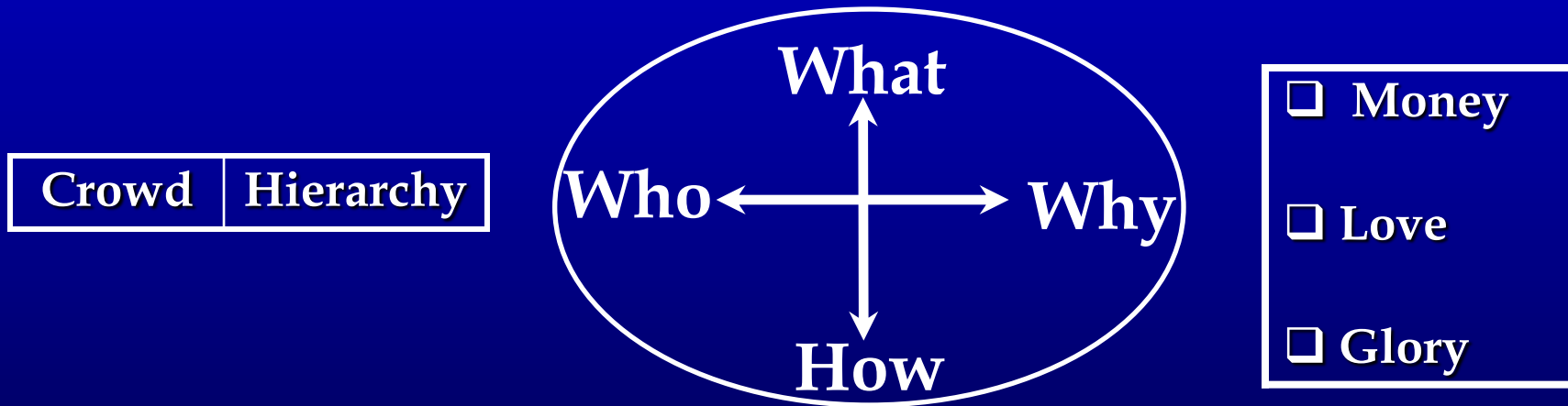
- **Money**
  - Direct payment
  - Help in getting future payment (e.g., advertising, learning)
- **Love**
  - Opportunities to socialize
  - Direct enjoyment of activity
  - Contribution to some larger cause
  - Enables access to something else desirable (e.g., captchas)
- **Glory**
  - Recognition
- ...

# When are the Why genes useful?

- There are many complex factors here!
- Appealing to Love and Glory, rather than Money, can often (though not always) reduce costs.
- It is often possible to influence the direction and speed of a group's activities by providing Money or Glory based on specific goals and deadlines.
- ...

**Failure to get motivational factors right is probably the single greatest cause of failure in collective intelligence experiments.**

# Types of organizational genes



# What?

- Create
  - E.g., create Linux software modules
- Decide
  - E.g., decide which Linux modules to include

# How?

	Crowd	
	Independent	Dependent
Create	Collection	Collaboration
Decide	Individual decisions	Group decision


# How?

	Crowd	
	Independent	Dependent
Create	Collection <ul style="list-style-type: none"><li>• Contest</li></ul>	Collaboration
Decide	Individual decisions	Group decision

# Gene: Collection

- Create pieces that can be made mostly independently of each other:
  - Wikipedia (collection of articles)
  - YouTube
  - Reddit
  - ...

# Wikipedia - Article



WIKIPEDIA  
The Free Encyclopedia

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## Massachusetts Institute of Technology

From Wikipedia, the free encyclopedia


Coordinates:  42°35′58.2″N 71°09′21.1″W

*"MIT" redirects here. For other uses, see [MIT \(disambiguation\)](#).*

The **Massachusetts Institute of Technology** (**MIT**) is a [private](#) research university located in [Cambridge, Massachusetts](#), United States. MIT has five schools and one college, containing a total of 32 academic departments, with a strong emphasis on scientific and technological research. MIT is one of two private [land-grant universities](#)<sup>[b]</sup> and is also a [sea-grant](#) and [space-grant](#) university.

Founded by [William Barton Rogers](#) in 1861 in response to the increasing [industrialization of the United States](#), the university adopted the [German university model](#) and emphasized laboratory instruction from an early date.<sup>[8]</sup> Its current 168-acre (68.0 ha) campus opened in 1916 and extends over 1 mile (1.6 km) along the northern bank of the [Charles River basin](#).<sup>[5]</sup> MIT researchers were involved in efforts to develop [computers](#), [radar](#), and [inertial guidance](#) in connection with [defense research](#) during [World War II](#) and the [Cold War](#). In the past 60 years, MIT's educational programs have expanded beyond the physical sciences and engineering into social sciences like [economics](#), [philosophy](#), [linguistics](#), [political science](#), and [management](#).<sup>[9]</sup>

### Massachusetts Institute of Technology



**Motto:** *Mens et Manus*

**Motto in** Mind and Hand<sup>[1]</sup>

# Intellipedia

- Wikipedia-like system for sharing information in the US intelligence community (CIA, DoD, etc.)
- Over 100,000 users
- One goal: Help different parts of the intelligence community “connect the dots” more effectively

# When is the Collection gene useful?

- Conditions for Crowd, plus:
  - The activity can be broken into small pieces that can be done mostly independently of each other.
    - » E.g., each is a complete solution to someone's problem
  - There are ways for people to find the pieces they want in the collection.
    - » E.g., the pieces are rated (in a later step) for interestingness
  - There are enough people who want this kind of thing in the first place.
  - ...

# Gene: Contest

- A subtype of Collection where one or a few items in the collection are selected as winners
- Examples
  - InnoCentive
  - TopCoder
  - Netflix prize
  - Yahoo Answers
  - Goldcorp challenge
  - Threadless
  - Matlab
  - Quirky

# Example: Quirky

- Consumer products company
- Community of 285,000 inventors
  - 1,500 product ideas / week submitted
  - 1 or 2 selected for development
- Company does detailed design with input from community
- Most manufacturing in Asia
- Retail sales through own website, Target, Amazon, ...

# When is the Contest gene useful?

- Conditions for Collection, plus:
  - Only one (or a few) good solutions are needed.
  - People are motivated by winning the contest
    - » E.g., for recognition or financial reward.
  - When whole solutions are required to enter contest:
    - » People are willing to submit a whole solution with no guarantee of reward.
    - » The creator of the contest wants to control financial risk.
      - No award is given unless someone solves the problem

# The Semantic Web...

- ... *is* a Collection built by a Crowd
  - ...uses Contests (e.g., Semantic Web Challenge)
- ... can be used to help make computers more useful in creating many other kinds of Collections and Contests
  - Bots editing Wikipedia
  - Bots writing sports news stories based on statistics
  - ...

# How?

	Crowd	
	Independent	Dependent
Create	Collection	Collaboration
Decide	Individual decisions	Group decision

# Gene: Collaboration

- Create pieces with important dependencies among themselves
- Examples
  - Wikipedia (individual articles)
  - Linux
  - Writing a business book Wikipedia-style
  - Climate CoLab

# Wikipedia – Talk page

## Unsourced material

[\[edit\]](#)

"Drinking from a fire hose" is now sourced.

(often expanded with the explanatory "you get hosed and your parents get soaked") or "academic boot camp."

There's no source for "you get hosed and your parents get soaked" and I wonder whether this has ever been in wide use or is just a joking backward folk-etymology. "Academic boot camp" sounds plausible but I'd like to see a source. I had the impression that these characterizations were supposed to be less true now than in the past, but perhaps that's just MIT administration propaganda?

I've certainly heard "you get hosed and your parents get soaked". MIT is definitely still a firehose. -- [Beland](#) 23:45, 3 April 2007 (UTC)

## Request for Feedback

[\[edit\]](#)

I had posted a [Requests for feedback](#) earlier in the month for comments on length and boosterism. This is in anticipation of my proposed request for a [peer review](#) on December 1. Please [go read the comments](#) and make changes. [Madcoverboy](#) 15:34, 21 November 2006 (UTC)

## Yikes! Wildly exaggerated [research accomplishments](#)

[\[edit\]](#)



This article's **factual accuracy is disputed**. Please see the relevant discussion on the [talk page](#). *(March 2008)*

# A Linux discussion forum

## LSB General Forum

Login to post a new forum topic.

### Community Support

#### ▼ Discussion Forums

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- Linux Development
- Linux Application Che
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### Stay Connected

 Linux Foundation Chann

 Follow Linux Foundation

 Linux Foundation Group

Topic	Replies	Created	Last reply▼
 ELF header question	1	1 day 12 hours ago by LSB List	1 day 10 hours ago by Wichmann Mats D
 failed to execute LSB4.0 perl testset in dtk-manager-2	2	3 days 7 hours ago by caoqian	2 days 19 hours ago by caoqian
 Couldn't find the X11 fonts directory when executing X11 related test sets in dtk-manager-2	0	3 days 7 hours ago by caoqian	n/a
 LSB conference call agenda (2009-06-24, 11am ET)	0	4 days 9 hours ago by licquia	n/a
 LSB CVS repository	2	6 days 6 hours ago by LSB List	6 days 1 hour ago by Wichmann Mats D
 LSB routing capabilities	2	1 week 3 days ago by LSB List	1 week 3 days ago by LSB List



In the Climate CoLab, you can work with people from all over the world to create proposals for what to do about climate change.

[LEARN MORE](#)[GET INVOLVED](#)

**NEWS:** Climate CoLab project enters new phase [Read more...](#)  
[Videos](#) about Climate CoLab...

The Climate CoLab is a project of the [MIT Center for Collective Intelligence](#) in collaboration with [many other organizations](#)

[Facebook](#)[Twitter](#)

## Featured contests [see all contests](#)



### Building efficiency: Social Actions

What social actions can encourage adoption of physical actions that increase building efficiency?

## Recent activity [see all activity](#)



1 day ago

[dickmcmanus](#) added comment to [Running on Empty](#) Caucus of USA Democrats in [Building the CoLab](#)

1 day ago



Proposal for [Contest 2011: Global](#) by [dennis](#)

# 2010 Winners Combined

DESCRIPTION

MODEL RESULTS

CONTRIBUTORS 1

COMMENTS 9

Show history

## Pitch

## Description

### Executive summary

This is an attempt at combining the three winning proposals of the 2010 contest. All three proposals have an emphasis on easing global negotiations.

Setting modest initial targets makes an initial agreement easier to achieve, paving the way for more aggressive action later.

Setting a price on carbon, instead of caps, allows countries to negotiate a single price they all agree on, instead of a separate cap for each country. This also makes it easier to renegotiate later.

Regional agreements are easier to accomplish than global ones. Adding carbon tariffs between the regions compensates for the economic inefficiencies that would otherwise result.

Each regional agreement should include both developed and developing nations, with the developed nations bringing developing nations along by assisting with climate adaptation. Focusing on adaptation initially helps build the foundation for more aggressive mitigation efforts later.

7 supporters [Support proposal](#)



Subscribe

### PROPOSAL SUMMARY

#### 2010 Winners Combined

**Team Proposal:** Only team members will be able to edit this proposal.



By: [dennis](#)

**Contest:** [Contest 2011: Global](#)

How should the global economy evolve through 2100, given the risks of climate change?

### MODEL RESULTS SUMMARY

#### CO2 concentration

607 ppm in 2100

#### Temperature Increase

3.0 °C

#### Mitigation Costs

-4.2% to 0.0% %GDP in 2100



# 2010 Winners Combined

DESCRIPTION

MODEL RESULTS

CONTRIBUTORS 1

COMMENTS 9

**Model:** This contest used the [MIT Composite Model](#).



Actions



Impacts

Developed countries emissions change

Fossil Fuel Emissions Change -30%

Start Year 2012 Target Year 2050

Rapidly developing countries emissions change

Fossil Fuel Emissions Change 100%

Start Year 2012 Target Year 2050

Other developing countries emissions change

Fossil Fuel Emissions Change 100%

Start Year 2012 Target Year 2050

Deforestation

0.5

Afforestation

0.5

Fossil Fuel Emissions

CO2 Concentration

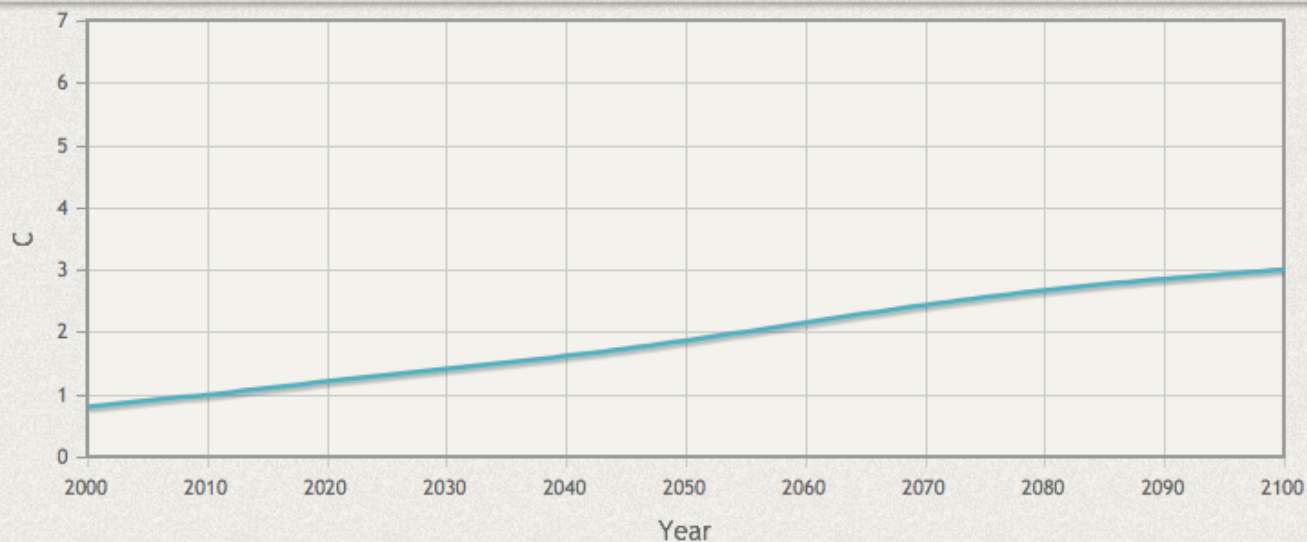
Temperature Change

Sea Level

Mitigation Cost

Damage Cost

Physical Impacts



Global mean temperature change above preindustrial values (degrees Celsius, 1 degree Celsius = 1.8 degrees Fahrenheit)



# Contest 2011: Global

Contest ended

Contest phases: **Voting phase** [Second phase](#) [First phase](#)

How should the global economy evolve through 2100, given the risks of climate change?

Voting has now ended and the contest results will be announced on November 16. Winning proposals will be featured in briefings now being planned at the United Nations and U.S. Congress. For more information, see [contest overview](#).

**What:** [Any actions](#) **Where:** [Global](#) **Who:** [Any organizations or individuals](#)

[Discussion](#)

## 3 proposals

Proposal name / Author(s)			Modified	Contributors
<a href="#">2010 Winners Combined</a> / <a href="#">dennis</a>	7	9	10/28/11	team only
<a href="#">The Planet Or Your Plate: mitigate climate change by going meatless</a> / <a href="#">beach-babe-in-fl</a> Mitigate climate change by a rapid reduction of the short lived warming gases by advocating for less meat consumption globally	77	49	11/1/11	team only
<a href="#">RewirePlus: Behaviour change and value change for the emerging green economy</a> / <a href="#">zannahmae</a> A shift to a green economy will require changes in behaviours and values all the way down to the individual. Here's how we get started!	16	6	10/31/11	team only

# When is the Collaboration gene useful?

- Conditions for Crowd, plus:
  - There are benefits of doing large scale things, and there is no satisfactory way of breaking the activity into small independent pieces
    - » Otherwise Collection would be better
  - There are satisfactory ways of managing the dependencies among the pieces
    - » See alternatives for Decision gene

# The Semantic Web...

- ... uses Collaborations to develop standards
- ... can be used to supercharge other kinds of Collaborations
  - Semi-automated estimates of emission reductions from different proposals in the Climate CoLab

# How?

	Crowd	
	Independent	Dependent
Create	Collection	Collaboration
Decide	Individual decisions	Group decision <ul style="list-style-type: none"><li>• Voting</li><li>• Consensus</li><li>• Prediction markets</li></ul>

# When is the Group Decision gene useful?

- Conditions for Crowd, plus:
- Everyone in the group needs to abide by the same decision.
  - What prediction will we base our plan on?
  - What features will our product have?
  - What move will we make?

# Gene: Voting

- IBM Jams (evaluation phase)
- Schaumburg Flyers
- Ebbsfleet United
- Kasparov v. the World
- Threadless

# Schaumburg Flyers

- Minor league baseball team near Chicago
- Through Internet voting, fans decide batting order, pitching rotation, starting line-up, and which players to trade
- Goal: Reality Baseball with fans all over the world visiting the web site frequently
- Result: Team had disappointing season. Some people blamed voting for bad results.

# Ebbfleet United

- UK football (soccer) team
- Shares purchased by over 30,000 members in over 80 countries
- Membership fee: £50 / yr (appx. \$77)
- Members vote on team selection, final budgets, player trades

# Kasparov vs. the World

- **Players:**
  - Gary Kasparov (world chess champion, 1999) vs. the rest of the world (moves decided by majority vote)
  - Kasparov heavy favorite before play began.
  - Used on-line discussions, and suggestions by 5 well-known chess experts
- **Result:** Kasparov won after 62 moves in 4 months.
- He said it was the hardest game he ever played.

# When is the Voting gene useful?

- Conditions for Crowd and Group Decisions:
  - The *average* voter has enough information, skill, and motivation to make a good decision
  - A single decision for the whole group is needed
  - ...
- Plus:
  - It is important for the group to be committed to the decision.

# Gene: Prediction markets

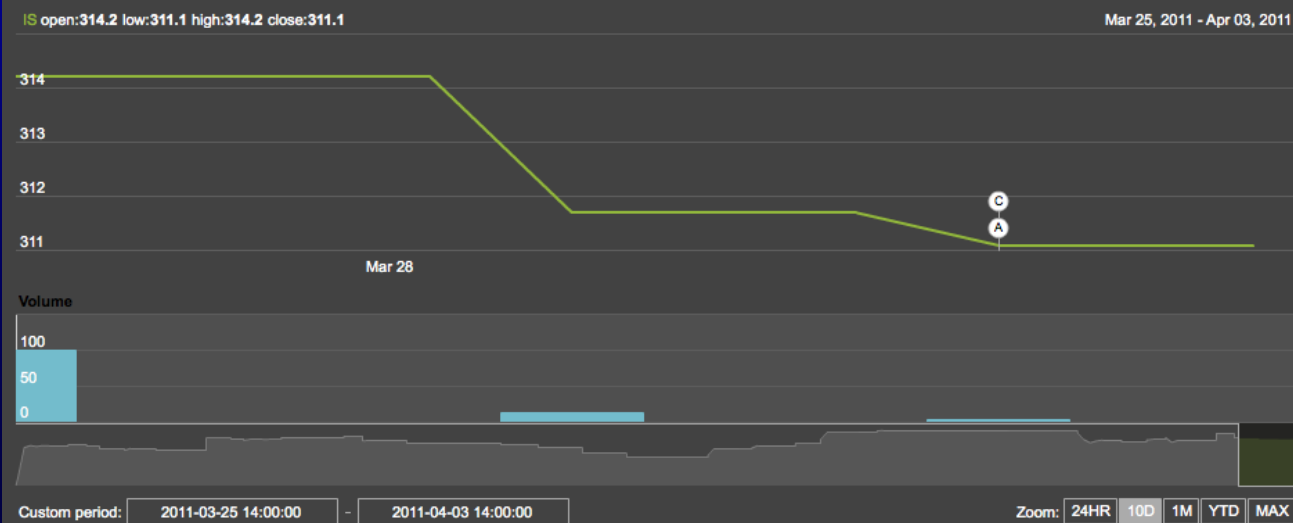
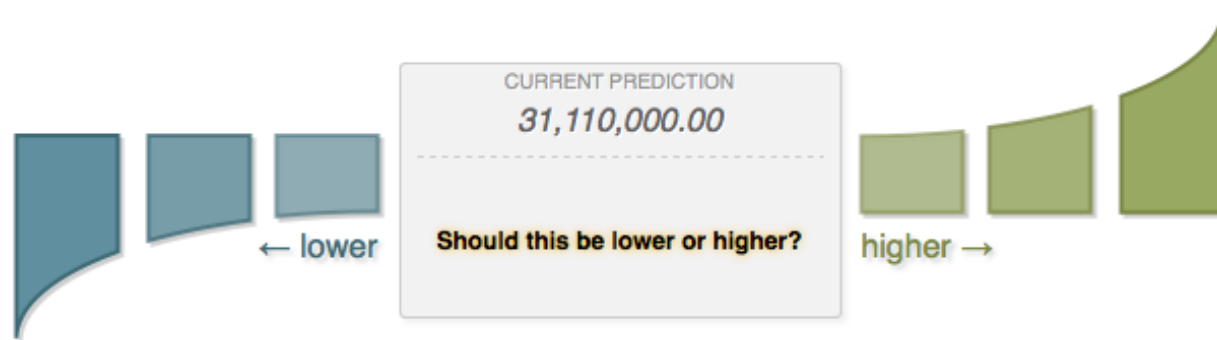
- Example: Predict future sales of HP printers
- Approach: Participants buy and sell *predictions* of future sales
  - E.g., Buy a “share” predicting sales in Sept. between 1501 and 1600 units
    - » If correct: get \$1
    - » If wrong: get \$0

## HP' s prediction markets (cont.)

- Participants were mostly from HP sales force
- 10 sales ranges
- Each person starts with 20 shares
- Market open for several days.
- Result: Better predictions than official HP sales forecasts

## How many iPads will Apple sell in 2011?

[» more info](#)



# Other examples of prediction markets

- Google – no. of users for current products, launch dates for new products
- Microsoft – release dates of products and internal tools
- Others – Eli Lilly drug testing, US Presidential elections, movie revenues, technological progress, . . .

# Collective prediction

- Goal: Combine people and computers to make best possible predictions
- Combine: Prediction markets, statistical forecasting
- System does routine work, people make corrections when appropriate
- Examples: Sales forecasts, competitor actions, football plays

# When is the Prediction Market gene useful?

- Conditions for Group Decision, plus:
  - Continuously updated information is useful
  - Providing strong incentives for information gathering and participation is important
  - Biases and non-independent information are okay, as long as some people have useful information

# The Semantic Web...

- ... uses Group Decisions to decide on standards
- ... can be used to help people make other kinds of group decisions
  - Agents help make predictions

# How?

	Crowd	
	Independent	Dependent
Create	Collection	Collaboration
Decide	Individual decisions <ul style="list-style-type: none"><li>• Market</li><li>• Social network</li></ul>	Group decision

# When is the Individual Decision gene useful?

- Conditions for Crowd, plus...
- Different people in the group can make their own choices, without being bound by the choices others make.
  - What book will I buy?
  - What web page will I look at?
  - What photo will I buy?

# Gene: Market

- Individuals can make their own choices about what to use, independent of what others choose.
  - They are often *influenced* by what others choose, but they are not required to choose the same thing.
- Their decisions are based, in part, on formal exchange using an explicit currency.

# Market examples

- Traditional markets
  - InnoCentive
  - eBay
  - iStockPhoto
  - Amazon Mechanical Turk
- Internal markets
  - Manufacturing resources (Intel scenario)

# When is the Market gene useful?

- Conditions for Individual Decisions, plus:
  - Money is useful to motivate people to provide the necessary effort or other resources
    - » People are often more motivated and creative when they are rewarded directly for their own efforts
  - Many people can work flexibly and simultaneously to achieve an overall goal.

# Gene: Social network

- Like a market, individuals can make their own choices about what to use, independent of what others choose.
  - Though individuals are not required to make the same choices as others, they are strongly influenced by the opinions and preferences of people they know and trust.
- Unlike a market, there is no formal exchange of value using an explicit currency.

# Social network examples

- Blogosphere
- YouTube popularity rankings
- Cyber-human intelligence
  - Google rankings
  - Amazon recommendation system

File Edit View Favorites Tools Help

Address [http://www.amazon.com/exec/obidos/subst/recs/instant-recs-home.html/ref=pd\\_jrl\\_gw\\_r/ref=amb\\_\\_151239\\_1/102-2000088-0040937](http://www.amazon.com/exec/obidos/subst/recs/instant-recs-home.html/ref=pd_jrl_gw_r/ref=amb__151239_1/102-2000088-0040937)

Go



(Beta-What is this?)

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HELP

Most Wished  
For Items

WELCOME

THOMAS'S  
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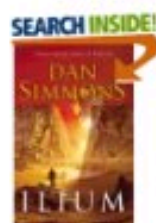
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1.

[Ilium \(Simmons, Dan\)](#)

by Dan Simmons

Average Customer Review:

Publication Date: July 1, 2003

Our Price: **\$17.13** [Used & new](#) from **\$5.25**

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2.

[Altered Carbon](#)

by RICHARD MORGAN

Average Customer Review:

# When is the Social Network gene useful?

- Conditions for Individual Decisions, plus:
  - Non-monetary motivations are enough for people to provide the necessary effort or other resources
  - Information about others' opinions helps people make their own choices.

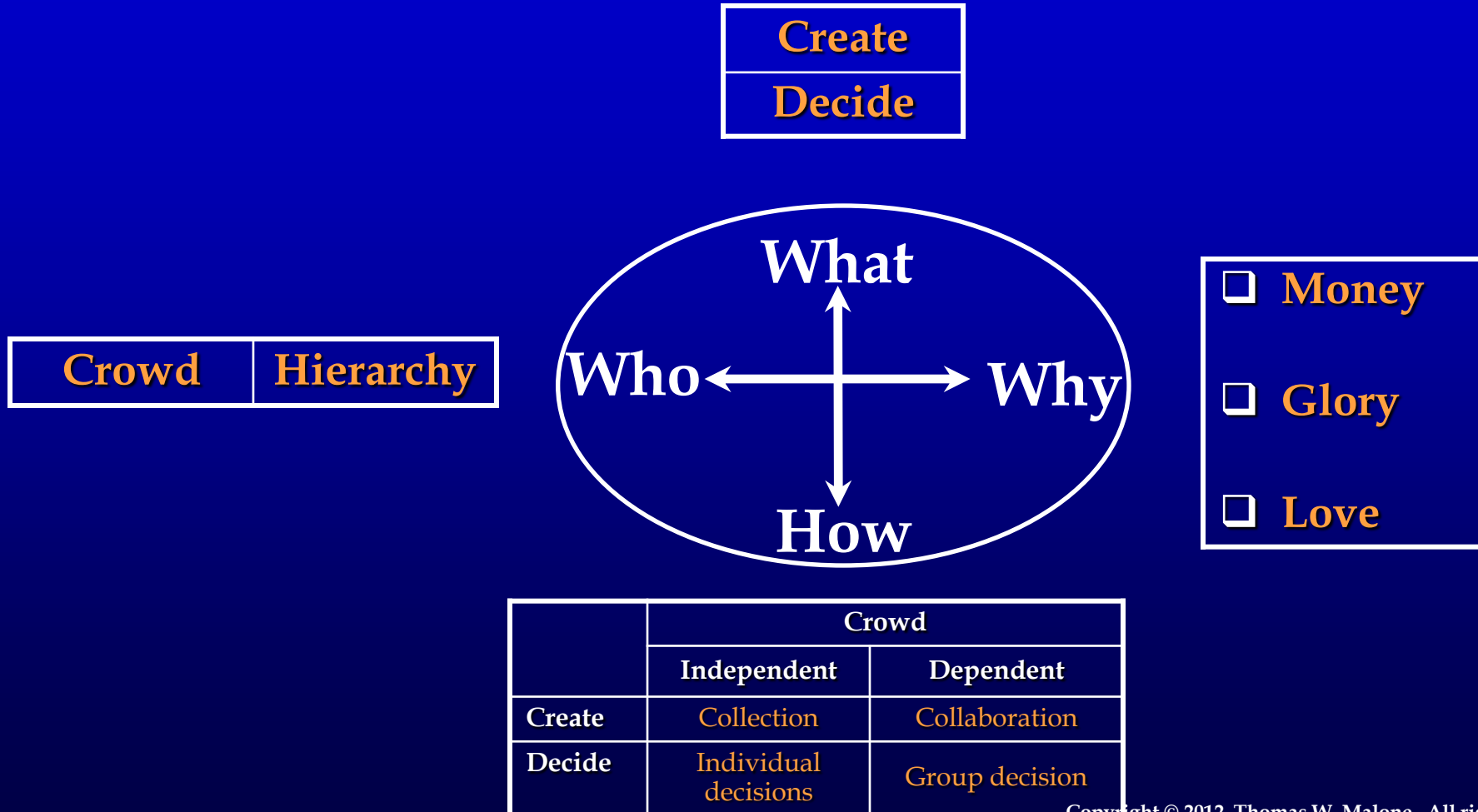
# How?

	Crowd	
	Independent	Dependent
Create	Collection <ul style="list-style-type: none"><li>• Contest</li></ul>	Collaboration
Decide	Individual decisions <ul style="list-style-type: none"><li>• Market</li><li>• Social network</li></ul>	Group decision <ul style="list-style-type: none"><li>• Voting</li><li>• Consensus</li><li>• Prediction markets</li></ul>

# CrowdLang

- Patrick Minder & Abraham Bernstein (2012)
- A programming language for the systematic exploration of human computation systems
- Explicitly supports the How genes
  - Collection, Contest, Collaboration, Group Decision...
- Facilitates implemented and recombining these design patterns in various ways

# Types of organizational genes



# What does this mean for the Semantic Web?

- We should think--not just how computers can do as much as possible--but about how people and computers can work together more effectively.
- Two things can help us do that:
  - Explicitly representing processes in semi-formal ways
  - Harnessing the design patterns (“genes”) embodied in recent innovative examples of collective intelligence

