

Trends of Technical and Business System Evolution - Anticipating Industry Change

AKA – Trends for Forecasting

4/16/15

David W. Conley

Agenda



- ▶ Forecasting Challenges
- ▶ What are Trends of System Evolution?
- ▶ Forecasting w/ Trends of System Evolution
- ▶ Scenario Planning Case Study (product) – Washing Machine
- ▶ War Gaming Case Study (service) – Parcel Delivery
- ▶ Smart Phone - Forecast Outcome Update



Forecasting Challenges

- Strategic Planning - requires some type of future state scenario forecasting.
 - Accuracy of forecasting = value of strategic planning.



=



- General Forecasting Methods:

- **Quantitative Forecasting (short-medium term)** – Requires a projection of past influencers into the future.

Dependent upon:

Quality of historical data

Continuance of past data trends

*(The farther into the future the less accurate
– inflection points are next to impossible to foresee)*

- **Qualitative Forecasting (medium-long term)** – Requires “knowing” what is coming.

Dependent upon:

Opinions and judgments of “experts.”

(The farther into the future the less accurate)





Forecasting Challenges

- General Forecasting Method Upgrades

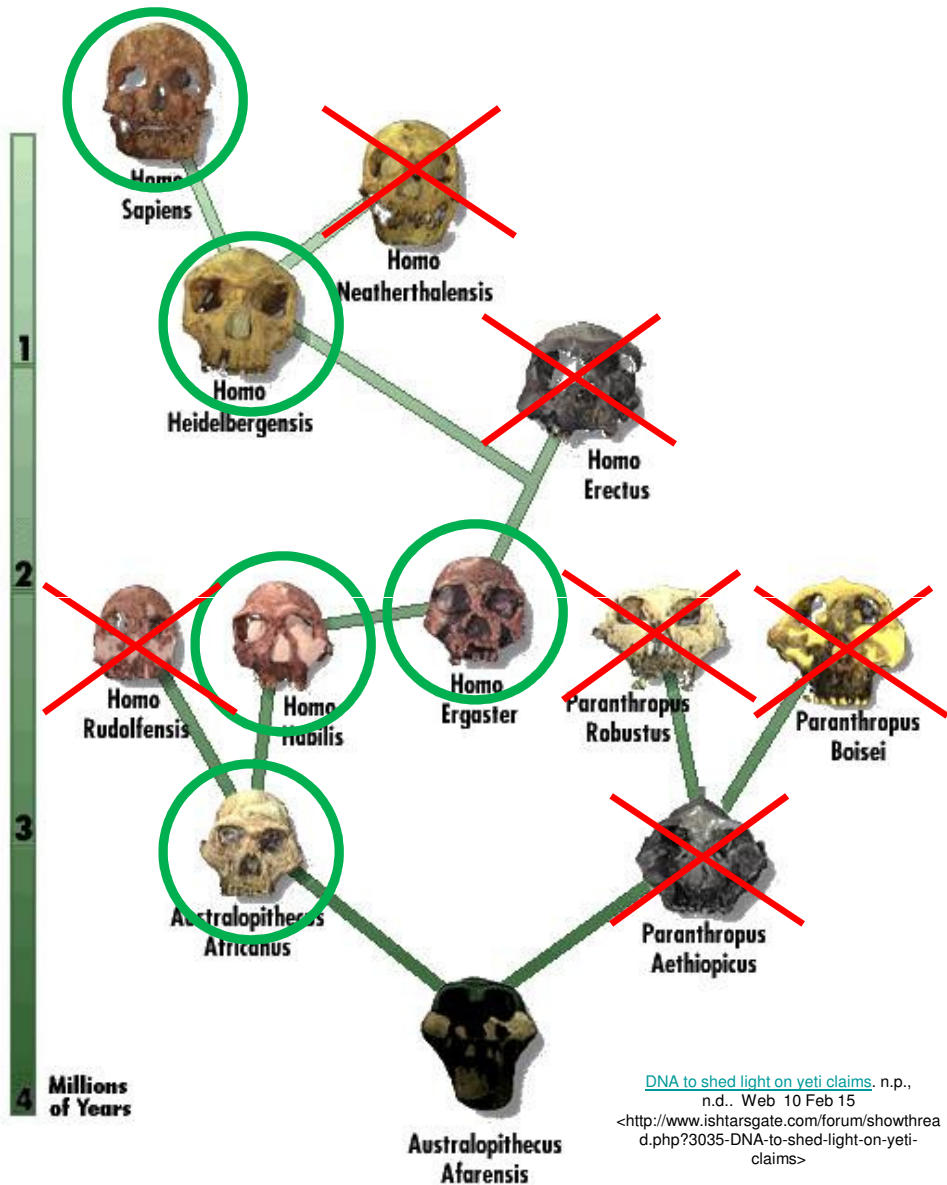
- Quantitative Forecasting (short-medium term) – Data extrapolation is useful and will benefit from the reality check of a dependable trending analysis. (creates visibility to inflection points)

- Qualitative Forecasting (medium-long term) – ~~Expert opinions~~ are risky (the farther in the future the higher the risk). Dependable trending analysis is preferable. (shows tech direction & inflection points)

- Trends of System Evolution – Powerful and accurate method of forecasting future states. The farther into the future, the more accurate.



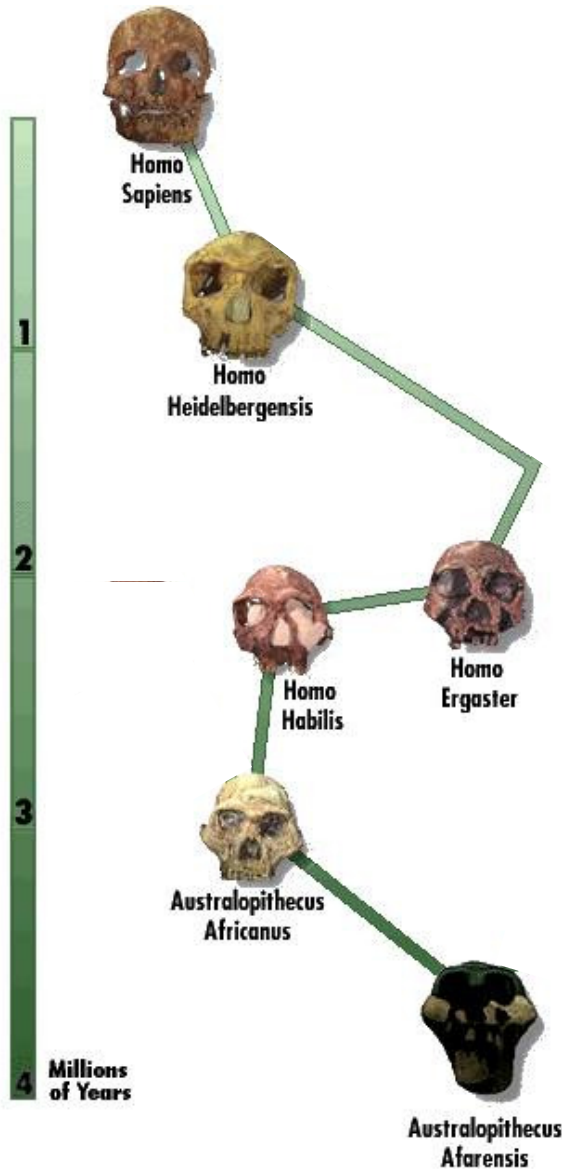
Trends of Engineering System Evolution Overview



Human evolution did not follow a single path.

Rather it followed multiple paths and the “winning” path is what we see today.

Trends of Engineering System Evolution Overview



[DNA to shed light on yeti claims](http://www.ishtarsgate.com/forum/showthread.php?3035-DNA-to-shed-light-on-yeti-claims). n.p., n.d.. Web 10 Feb 15
<<http://www.ishtarsgate.com/forum/showthread.php?3035-DNA-to-shed-light-on-yeti-claims>>

After the fact, the “winning” pathway can be studied and accurate predictions of what is to come can be made.

The same is true of technical and business systems evolution.



What is System Evolution?

Medicine Delivery



Organizations (Structure)

Pre-bureaucratic structures	Bureaucratic structures	Post-bureaucratic	Functional structure	Divisional structure	Matrix structure	Organizational Circle: moving back to flat	Team	Network	Virtual	Hierarchy-Community Phenotype
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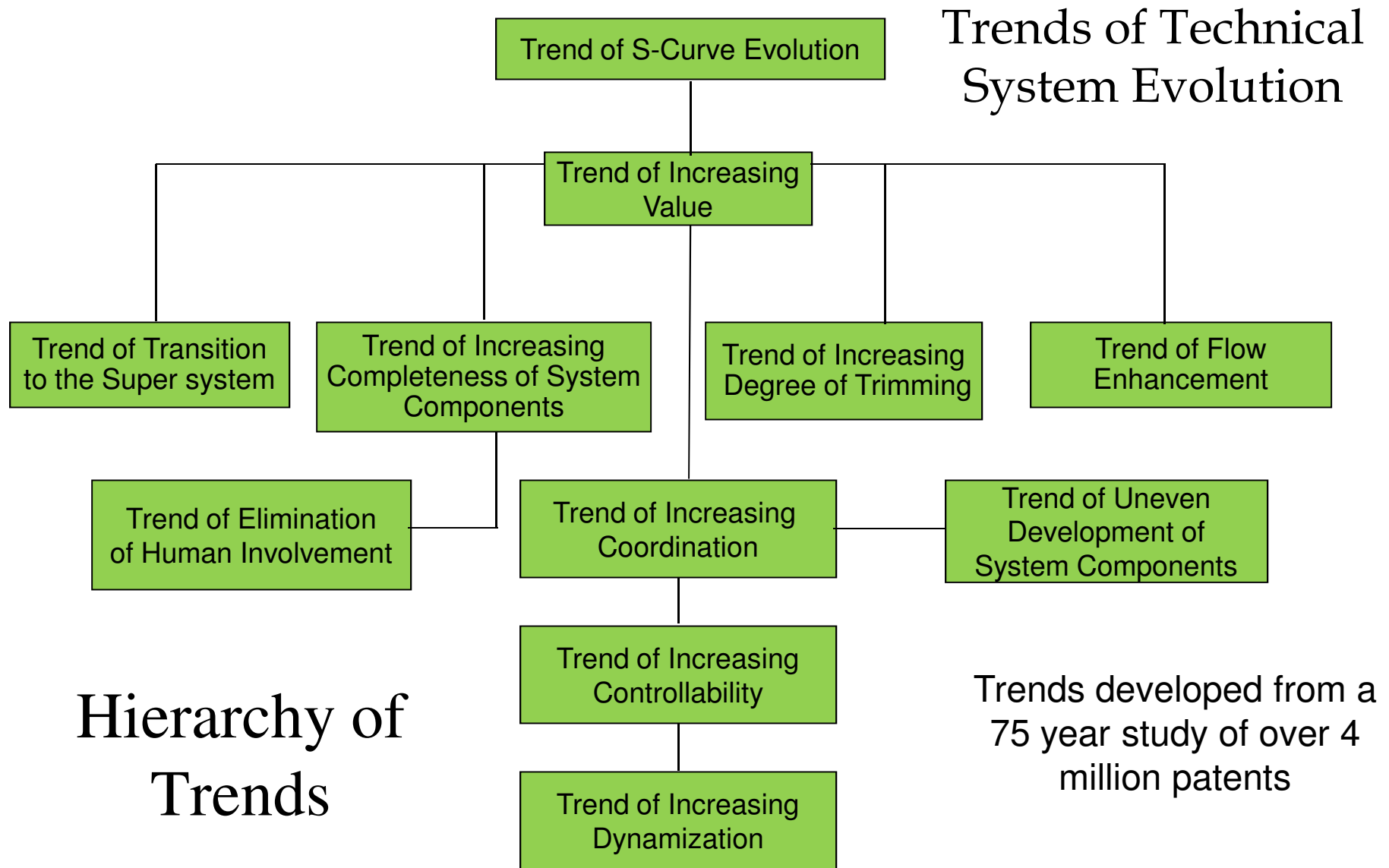
Snowshoes



- **System evolution is the natural changes to a system and is driven by the search for the “best” system for the environment**
- The evolution effects entire objects (airplanes) and/or portions thereof (fuel pumps)
- The evolution applies at the macro level (org. structure) or the micro level (work flow)
- All systems are driven by the trends and can therefore be accurately predicted (no more trial and error)

Understanding and utilizing the evolutionary laws provides tremendous vision and insight

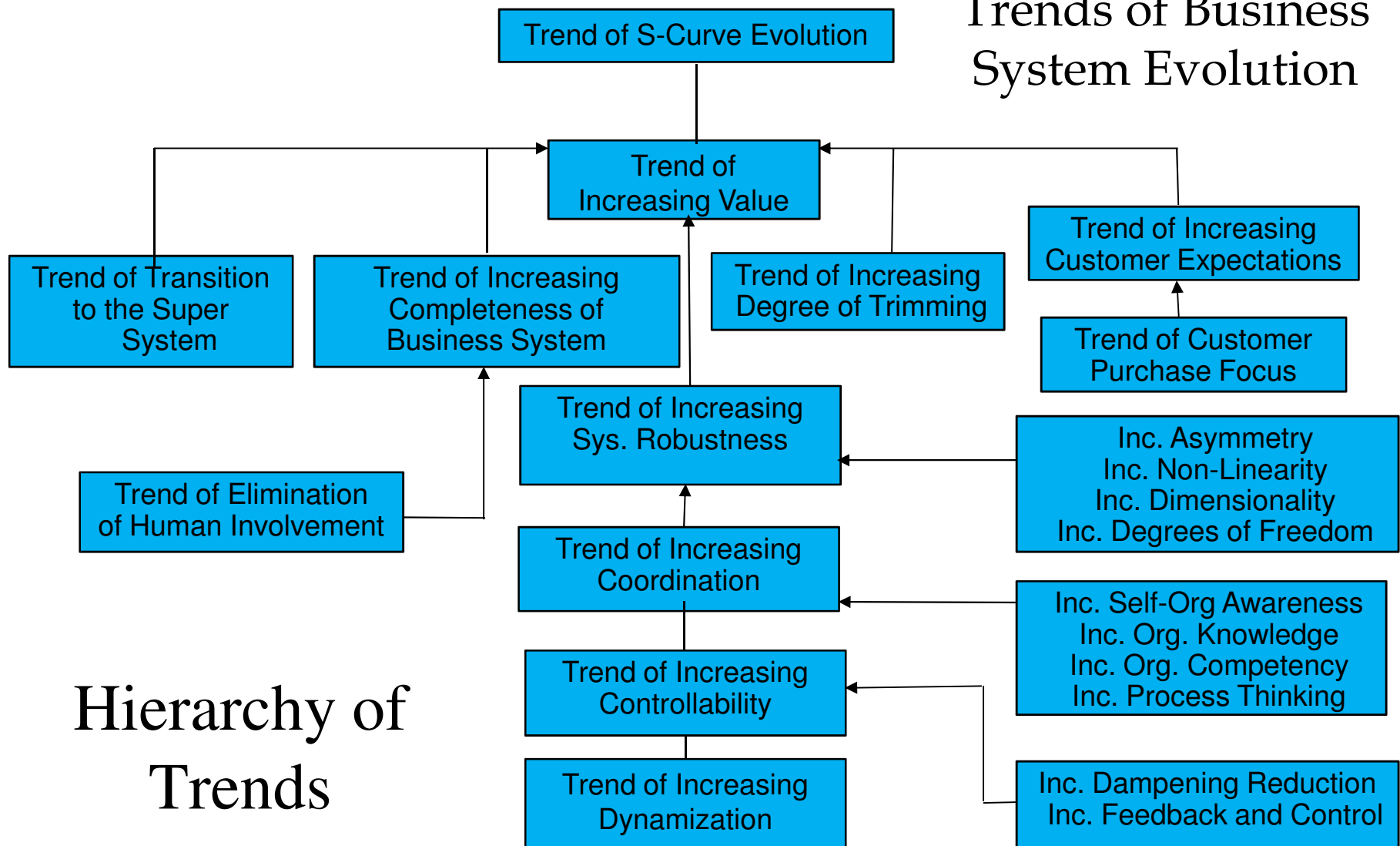
What is Trends of System Evolution?



What is Trends of System Evolution?



Trends of Business System Evolution



Hierarchy of Trends

Application of Trends of System Evolution to Forecasting



• Scenario Planning



- Forecasting required to establish the environmental scenario so that plans can be made towards meeting the challenges of that scenario
- Bottoms up approach in defining ecosystem influence on future states
- **Trend Application – Apply trends to “create” eco-system future states and then plan responses**

• War Gaming



- Forecasting required to establish the organizational position so that approximations of competitor and market place reactions can be simulated and studied
- Tops down approach in testing organizational direction and planning
- **Trend Application – Apply trends to plan changes and then test competitor/market place responses**

Application of Trends of System Evolution to Forecasting



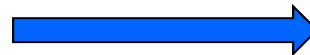
- Scenario Planning



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•Trend Application - Apply trends to “create” eco-system future states and then plan responses

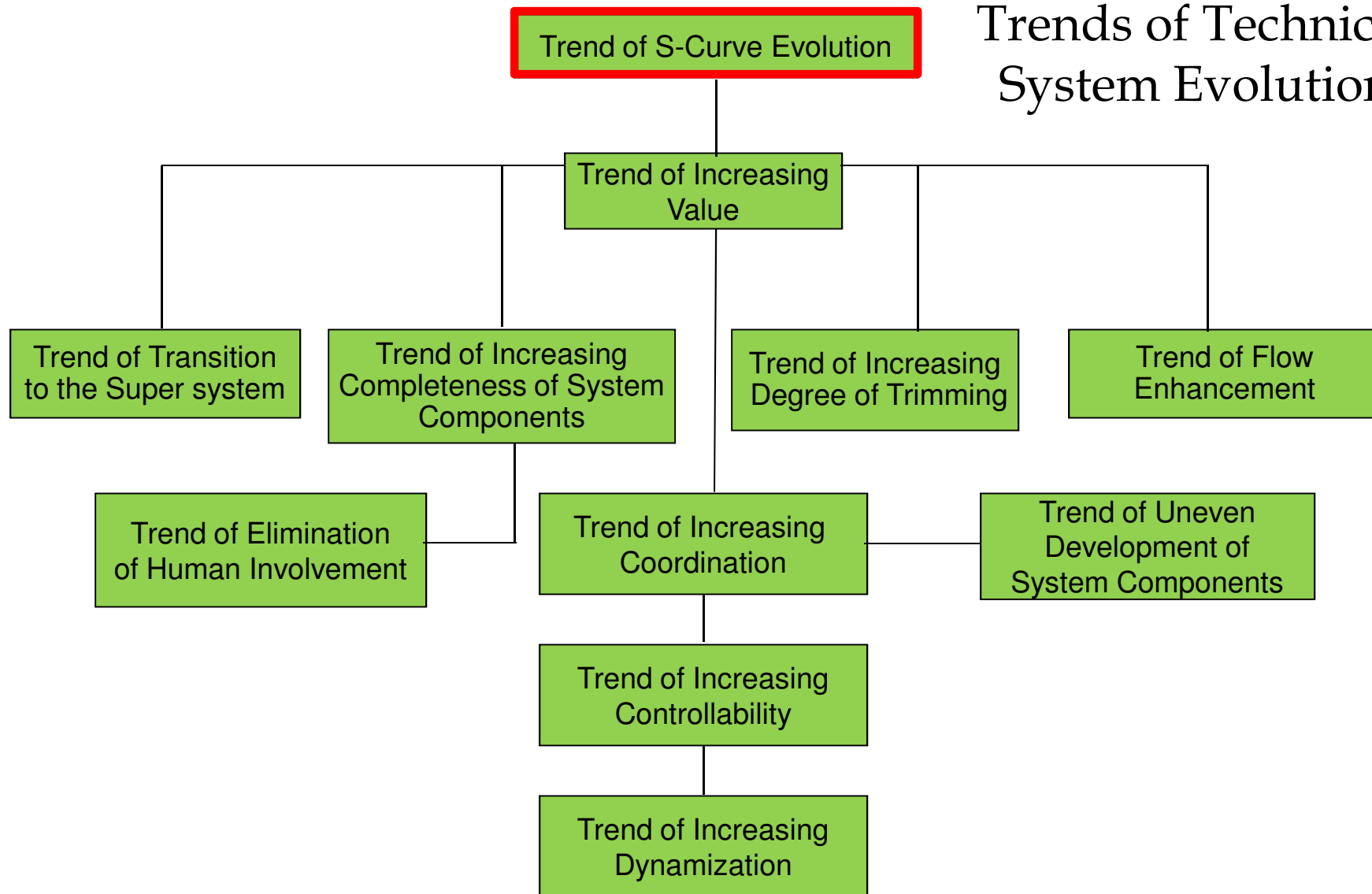
Case Study - Future state of washing machine



What is Trends of System Evolution?



Trends of Technical System Evolution

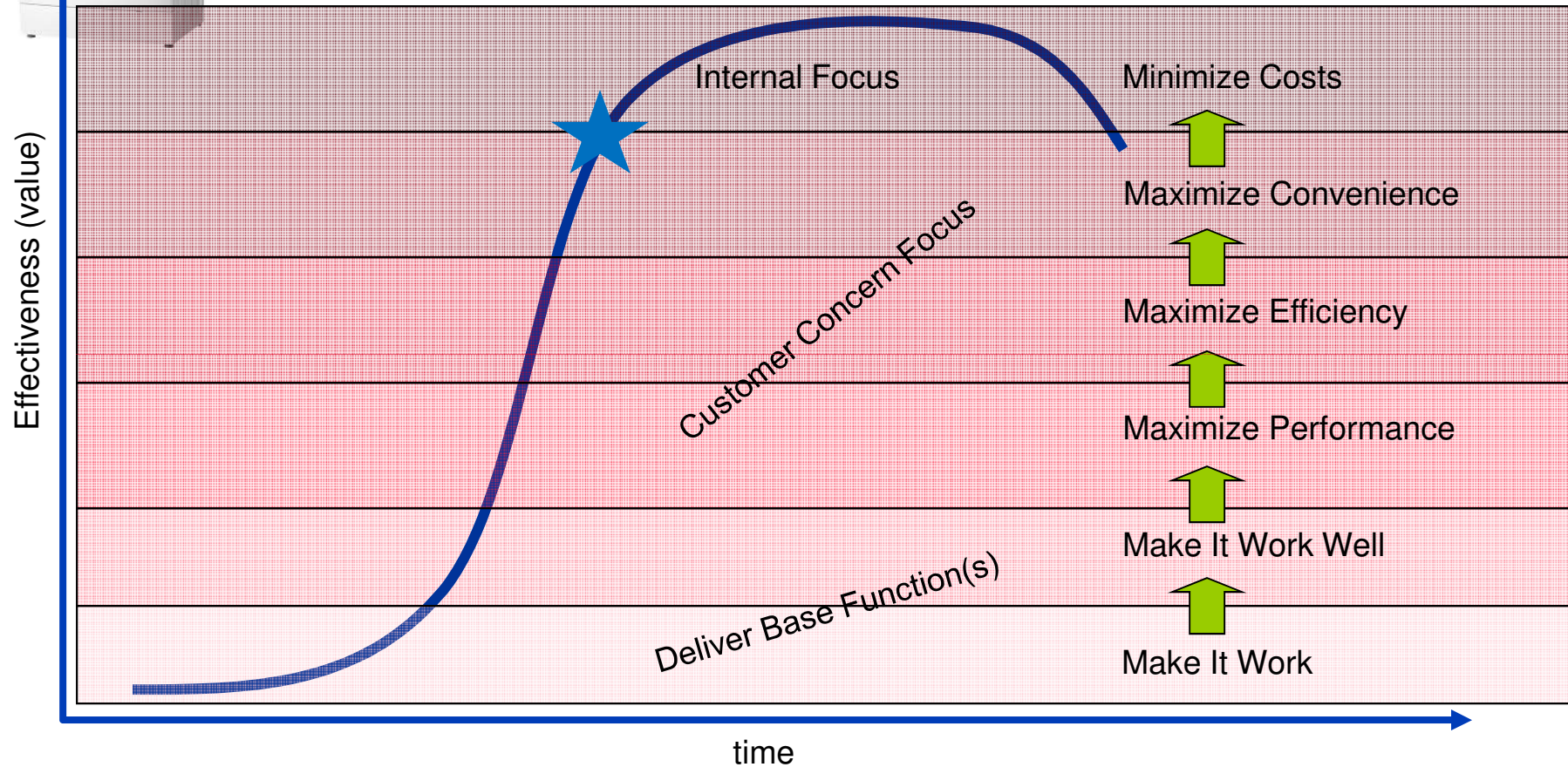


Trend of S-Curve Evolution



Need to minimize cost of current system and develop new "principle of action"

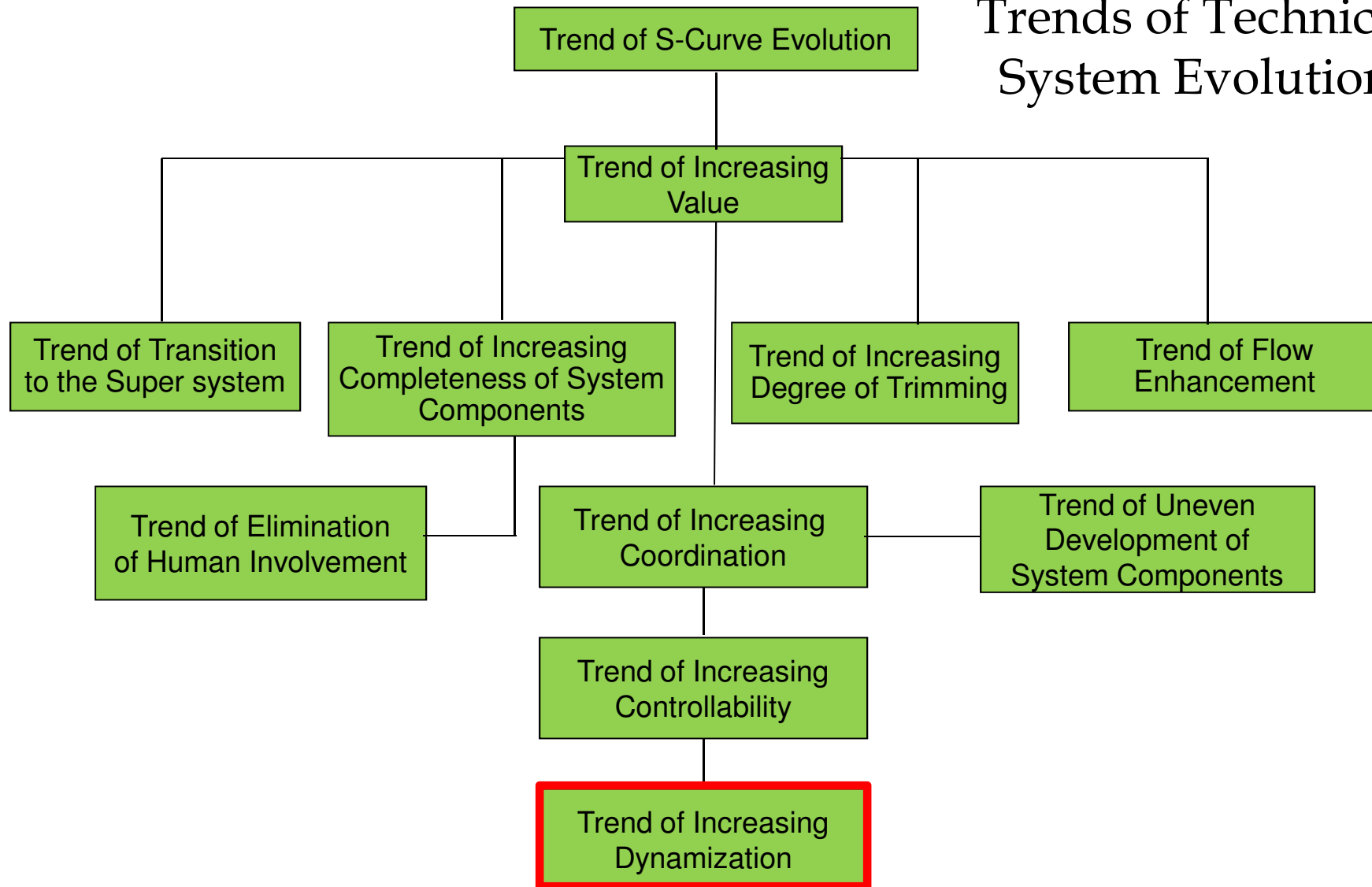
Example: *removing dirt*



What is Trends of System Evolution?



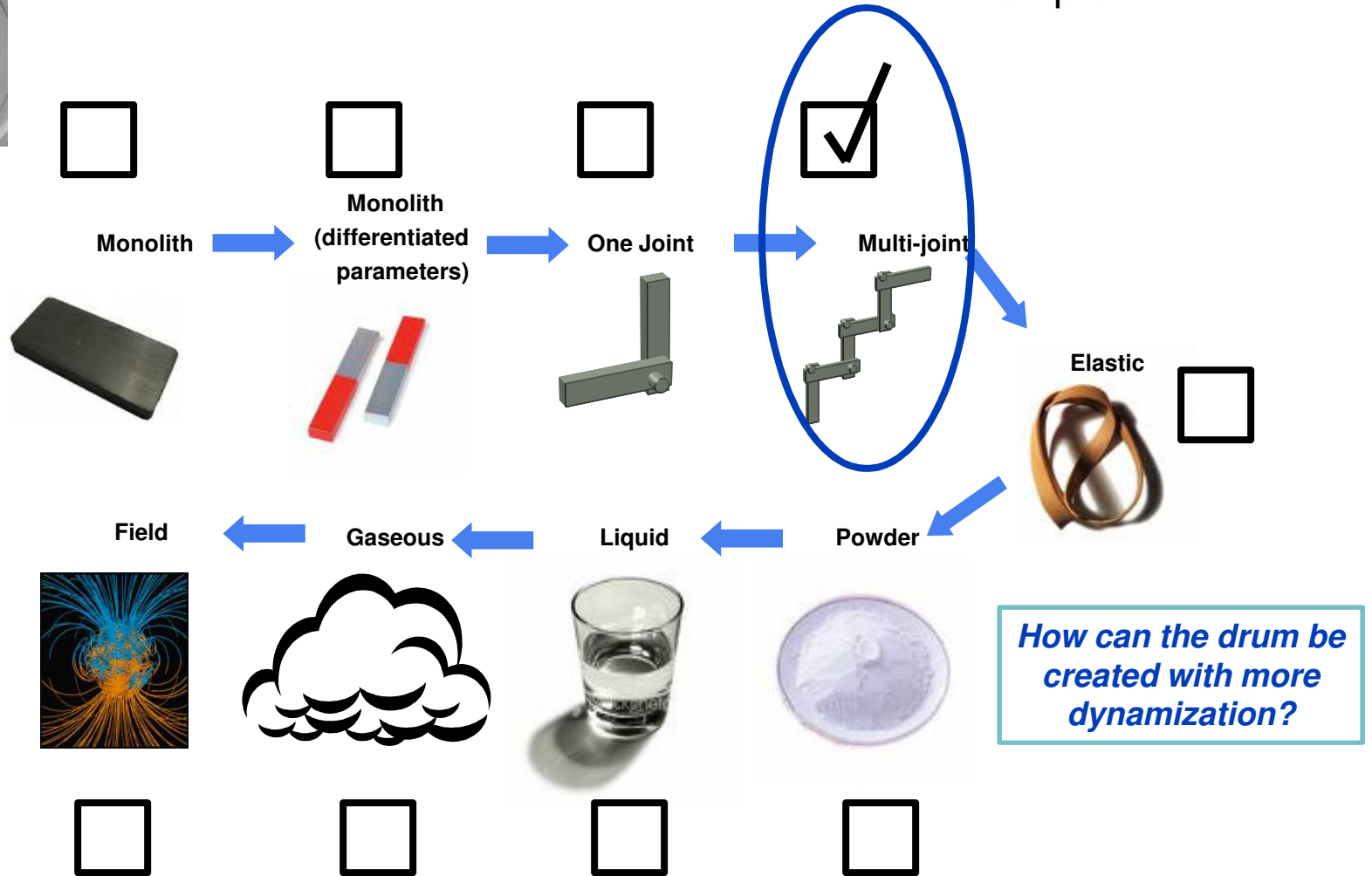
Trends of Technical System Evolution



Trend of Inc. Dynamization



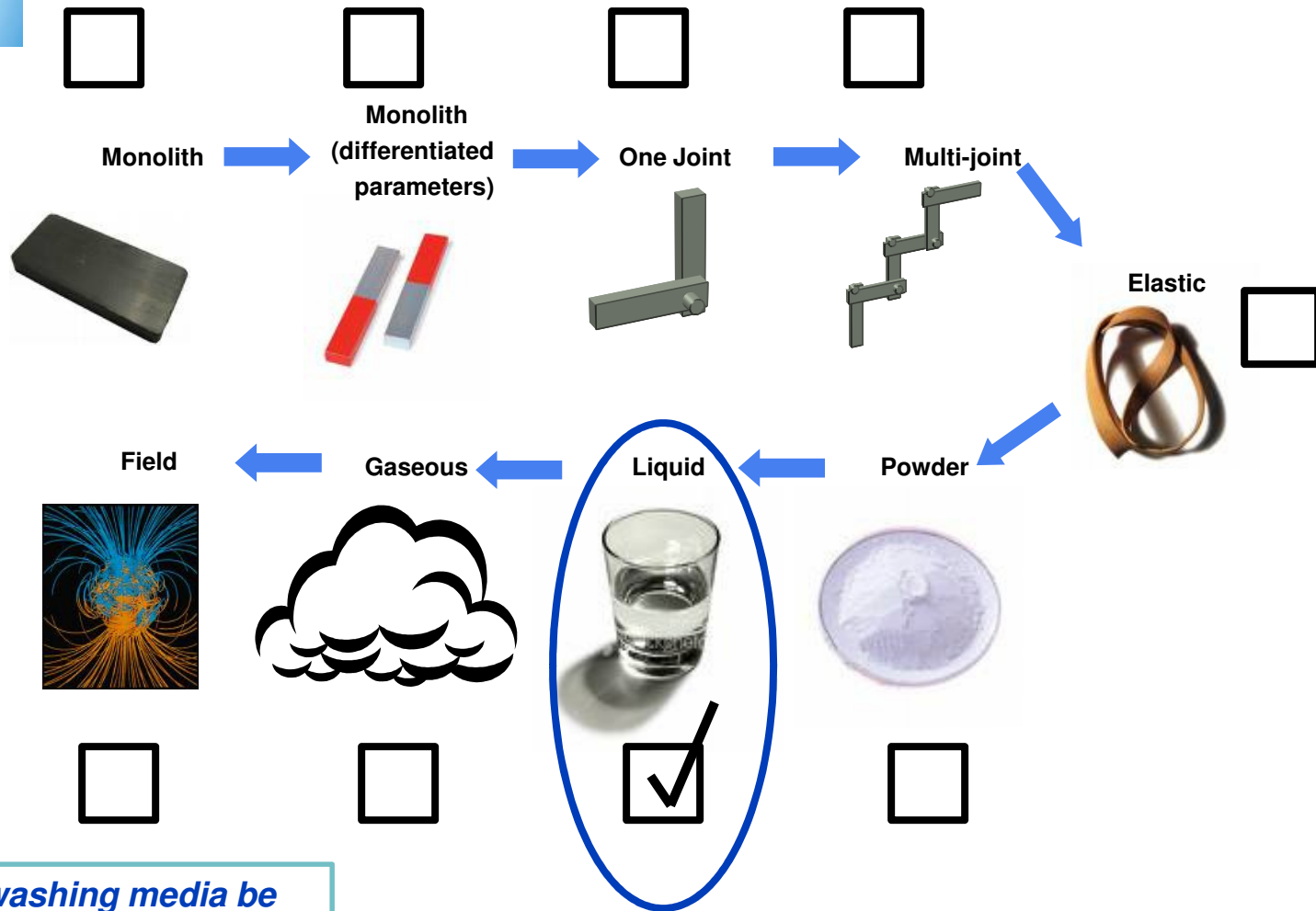
Example: wash drum



Trend of Inc. Dynamization



Example: washing media

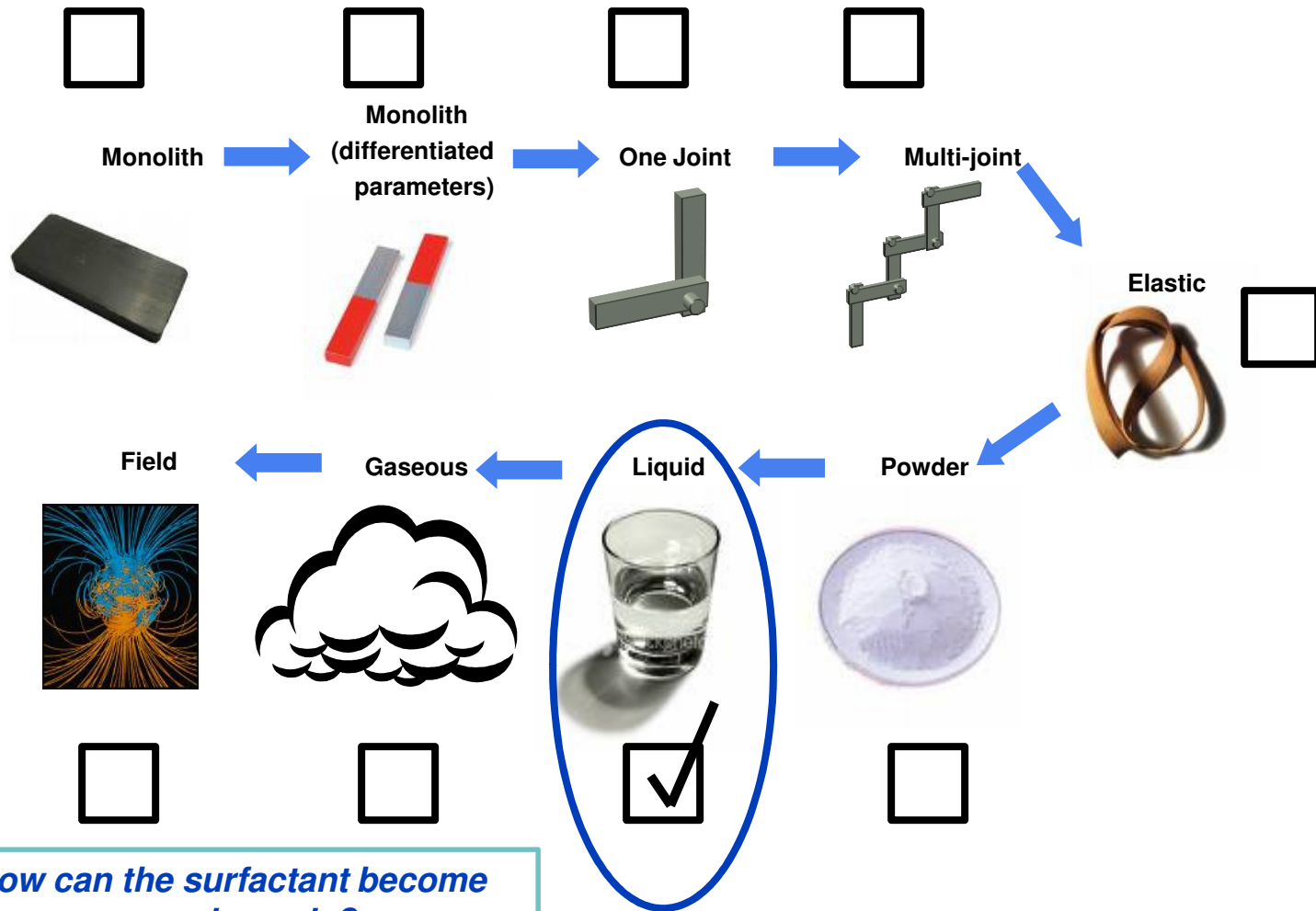


How can the washing media be created with more dynamization?

Trend of Inc. Dynamization



Example: surfactant (soap)

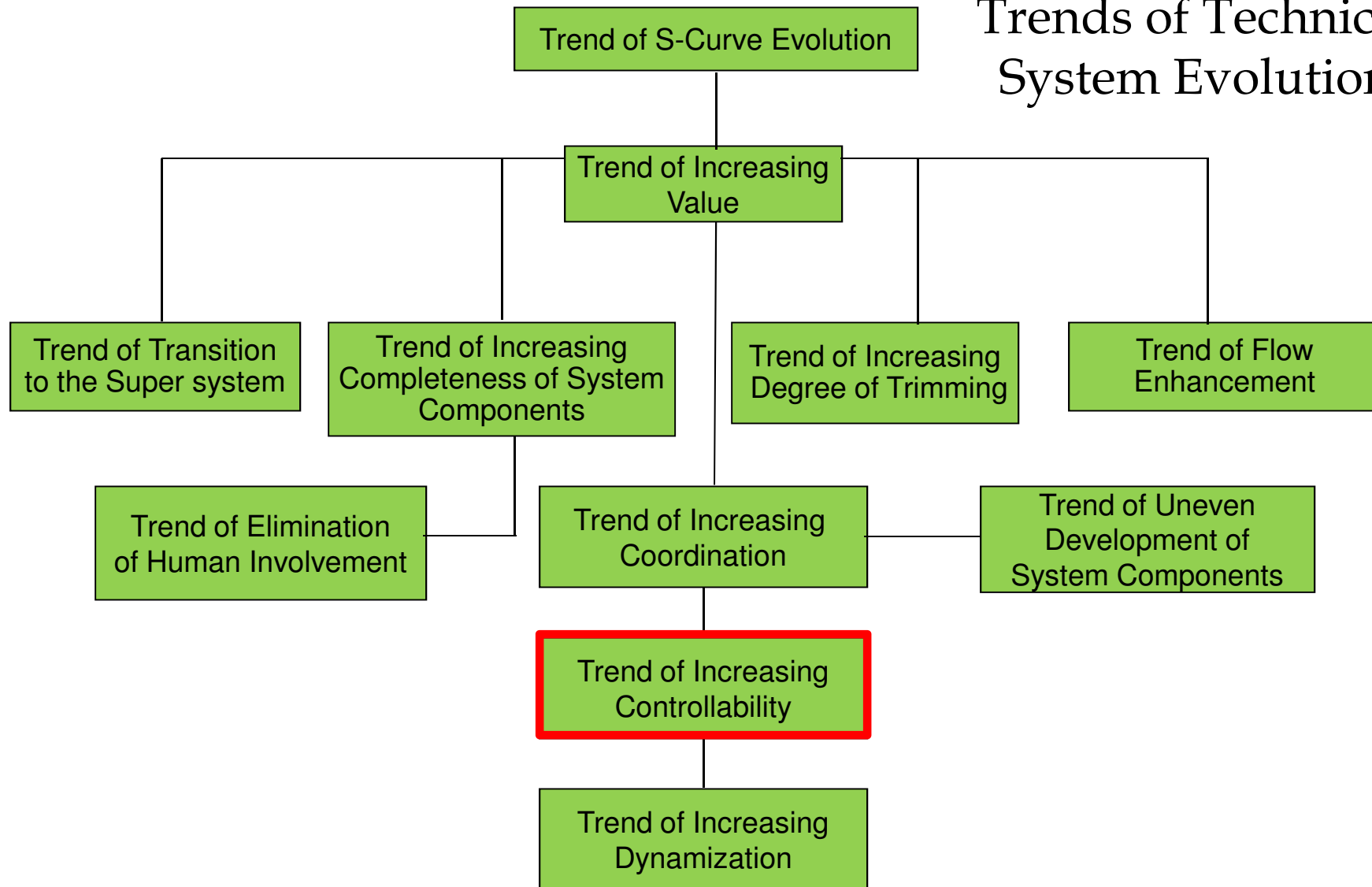


How can the surfactant become more dynamic?

What is Trends of System Evolution?



Trends of Technical System Evolution



Trend of Inc. Controllability



Example: control system

- Trend of Increasing Controllability:
Subtrend 1 – Increase Level of Control

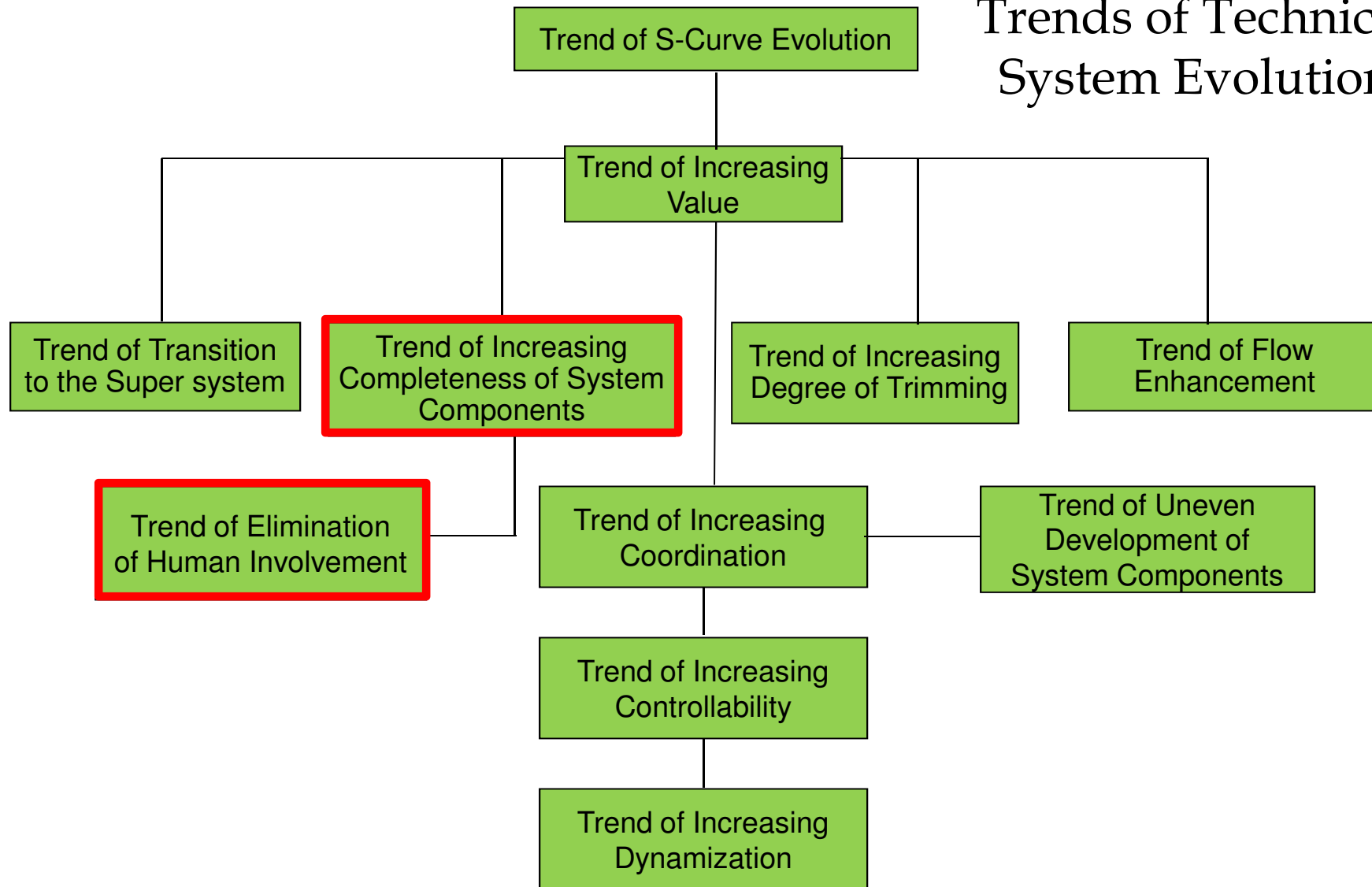
- Uncontrolled system
- Fixed program
- Fixed program with intervention
- Externally controlled system
- Self-controlled system

*The control system
needs to be
completely “self-
controlled”*

What is Trends of System Evolution?



Trends of Technical System Evolution



Trend of Elimination of Human Involvement



Example: washing machine

-Humans Stop Performing:

System Starts Performing:



Transmission



Energy Source



Control



Decision Making



What would fully transitioned Elimination of Human Involvement look like?



Trend Solution Generation



Example: washing machine

Next Generation Washing Machine Forecast

- S-Curve says current system must become very cheap and that new principle of action is needed to stay relevant
- Tank and agitator will become more dynamic, maybe flexible, or maybe even liquid, gas or field
- Washing media will become a gas or field
- Washer will become completely autonomous
- “Soap” will become ionizing radiation
- The system will completely control itself

Concept – clothes are automatically cleaned individually as needed while hanging in your closet by ionizing radiation with a gas cloud to carry away the loosened soil





“OK, but the advancements are probably way off. Right”?

(CNN) -- Designers behind a washing machine that does not require water or detergent to clean clothes say the idea could be a common household appliance one day. - 2005

NASA – Cold Water No Detergent-
Laundry Technology - 2010



Water Based, Ionizing
& Air Drying- 2008



Ionizing Hand Held
Cloth Cleaner - 2012

Application of Trends of System Evolution to Forecasting



Case Study – Develop delivery service of the future



•War Gaming



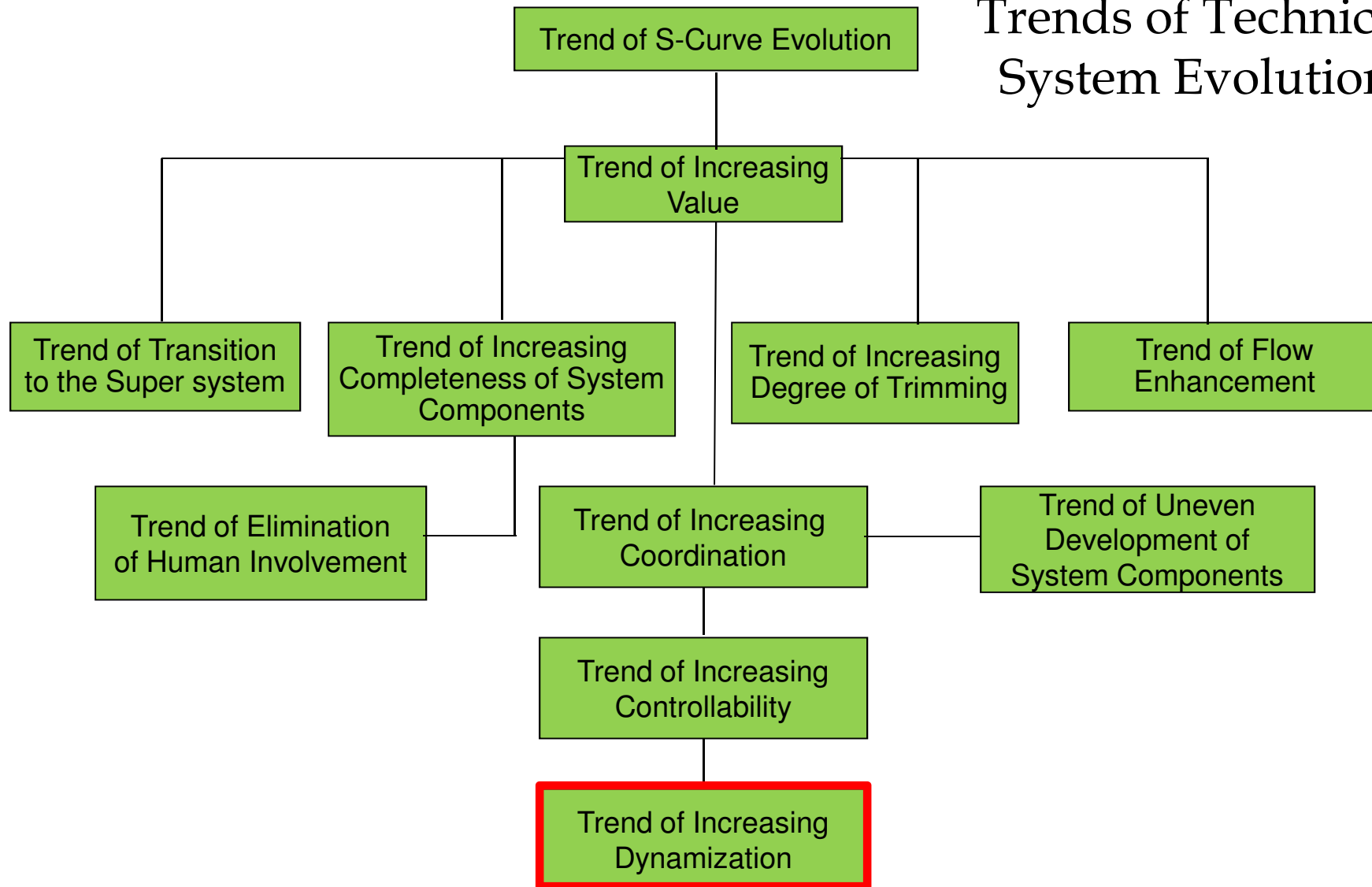
- Forecasting required to establish the organizational position so that approximations of competitor and market place reactions can be simulated and studied
- Tops down approach in testing organizational direction and planning

• Trend Application – Plan changes by way of trend application and then test competitor/market place responses

What is Trends of System Evolution?



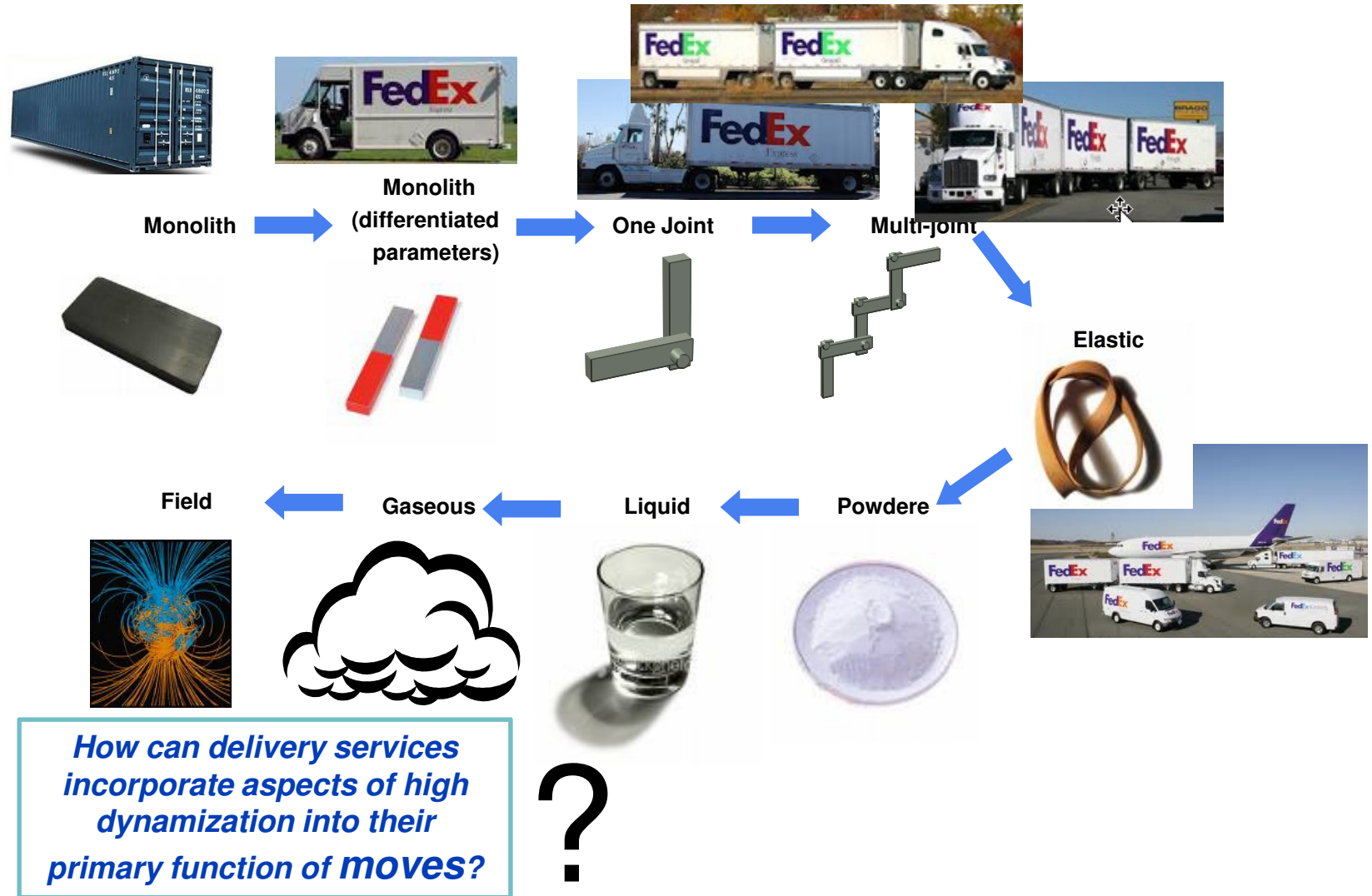
Trends of Technical System Evolution



Trend of Inc. Dynamization



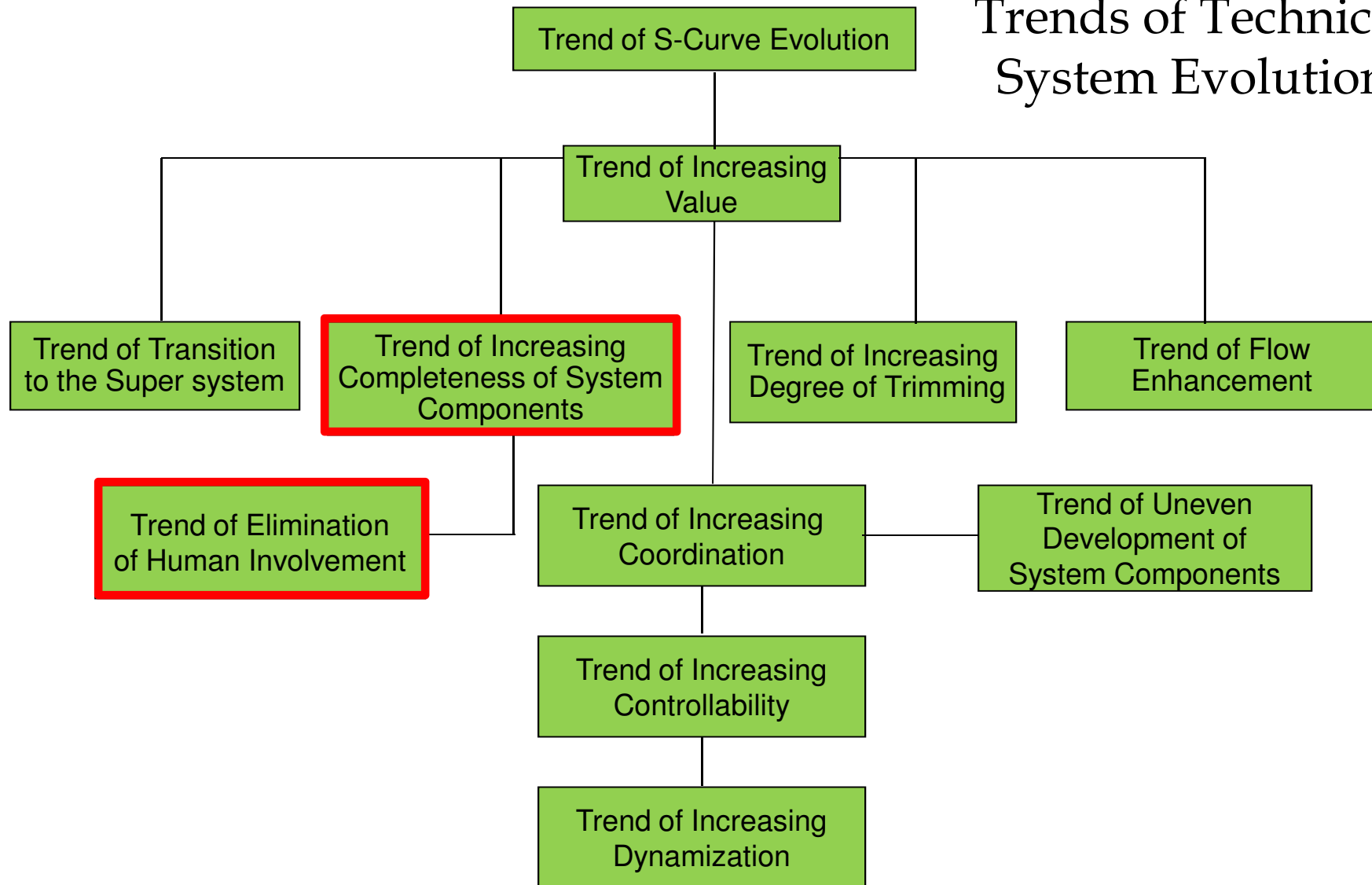
Example: *moving material*



What is Trends of System Evolution?



Trends of Technical System Evolution



Trend of Elimination of Human Involvement



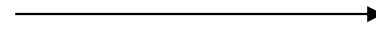
Example: delivery

Trend of Decreasing Human Involvement
Humans Stop Performing:

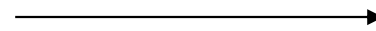
Trend of Increasing System Completeness
System Starts Performing:



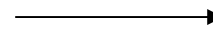
Transmission



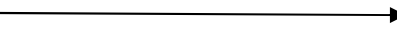
Energy Source



Control



Decision Making

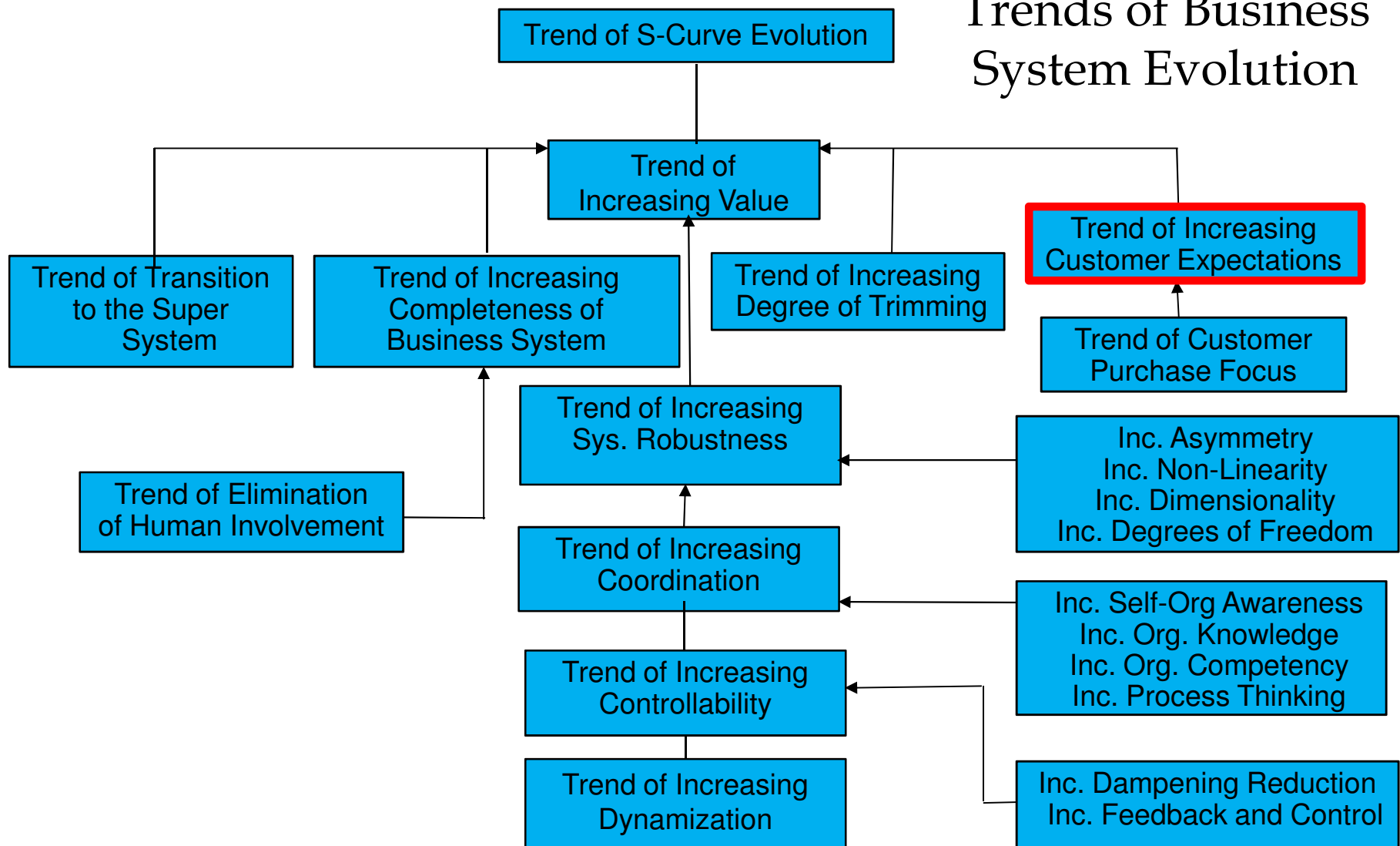


*How else can
FedEx push
decision
making out
into the
system?*

What is Trends of System Evolution?



Trends of Business System Evolution



Trend of Inc. Customer Expectations



Example: service

- As customers have more understanding of a business system their expectations of the process increase

commodity



product



service



experience



transformation



FedEx

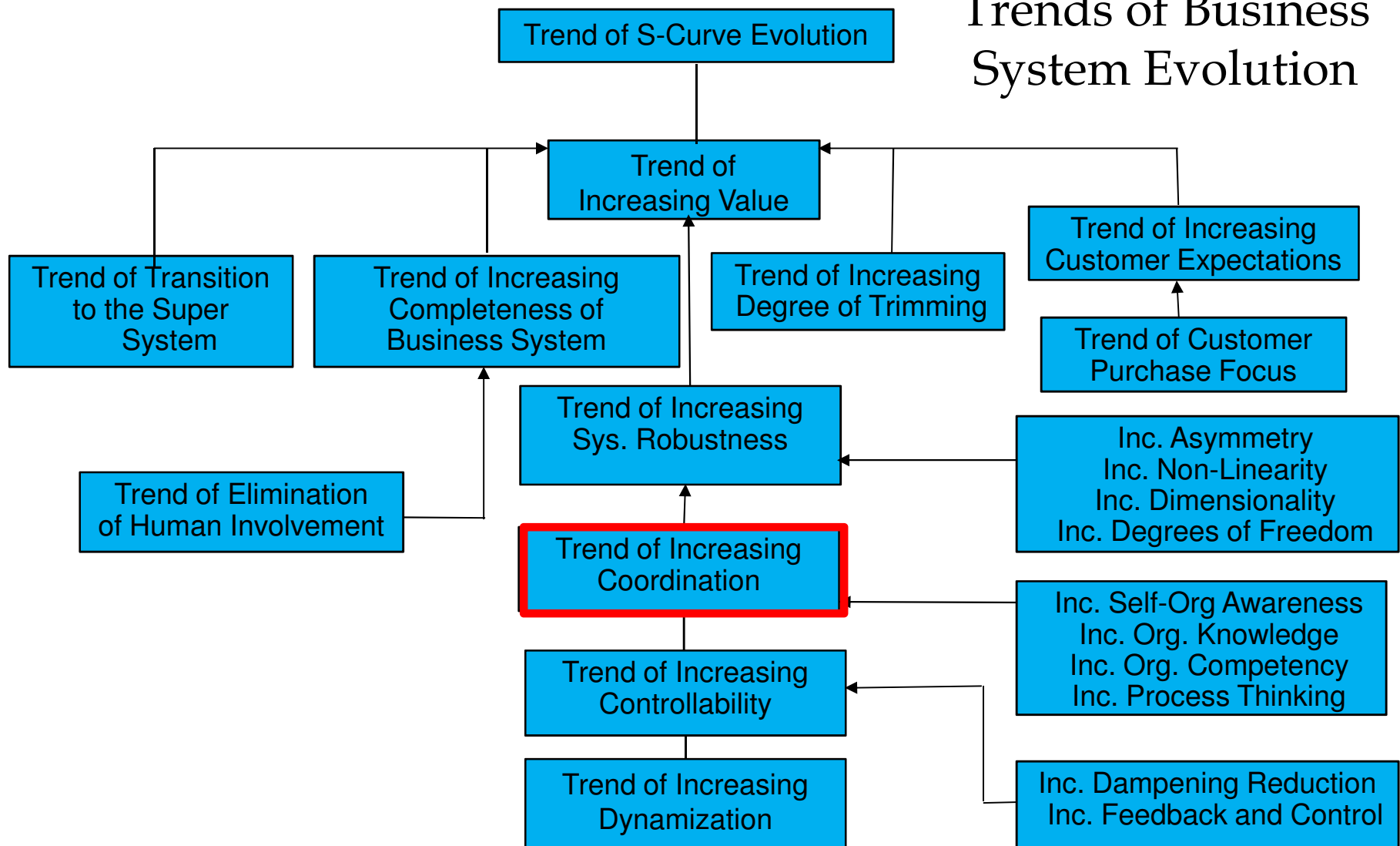


What will FedEx look like when they move to the transformation stage (custom products target to individuals based on company's expertise)?

What is Trends of System Evolution?



Trends of Business System Evolution



Trend of Inc. Action Coordination



Example: coord.

- As processes mature they increasingly coordinate with their internal operations and with the environment

Non-coordinated action



Full route usage even if no freight (equipment must be moved to support subsequent operations)

Partially coordinated action



Freight coordinated at distribution points

Fully coordinated action



All shipping is specifically coordinated with shipping demand (i.e., shipped when ordered, direct route to destination, no transfer delays)

Different actions during intervals



Switching to assembly during shipping intervals to increase the customer experience

How can FedEx fully coordinate its operations and provide additional services to its customers during intervals?



Trend Solution Generation

- Trend of Increasing Dynamization
 - Powder, Liquid
 - Gaseous, Field

- Trend of Decreasing Human Involvement/Increasing System Completeness
 - Push decision making out into the system

- Trend of Increasing Customer Expectations
 - Custom products pushed to (or pulled by) individuals

- Trend of Increasing Action Coordination
 - Fully coordinate operations and provide interval services

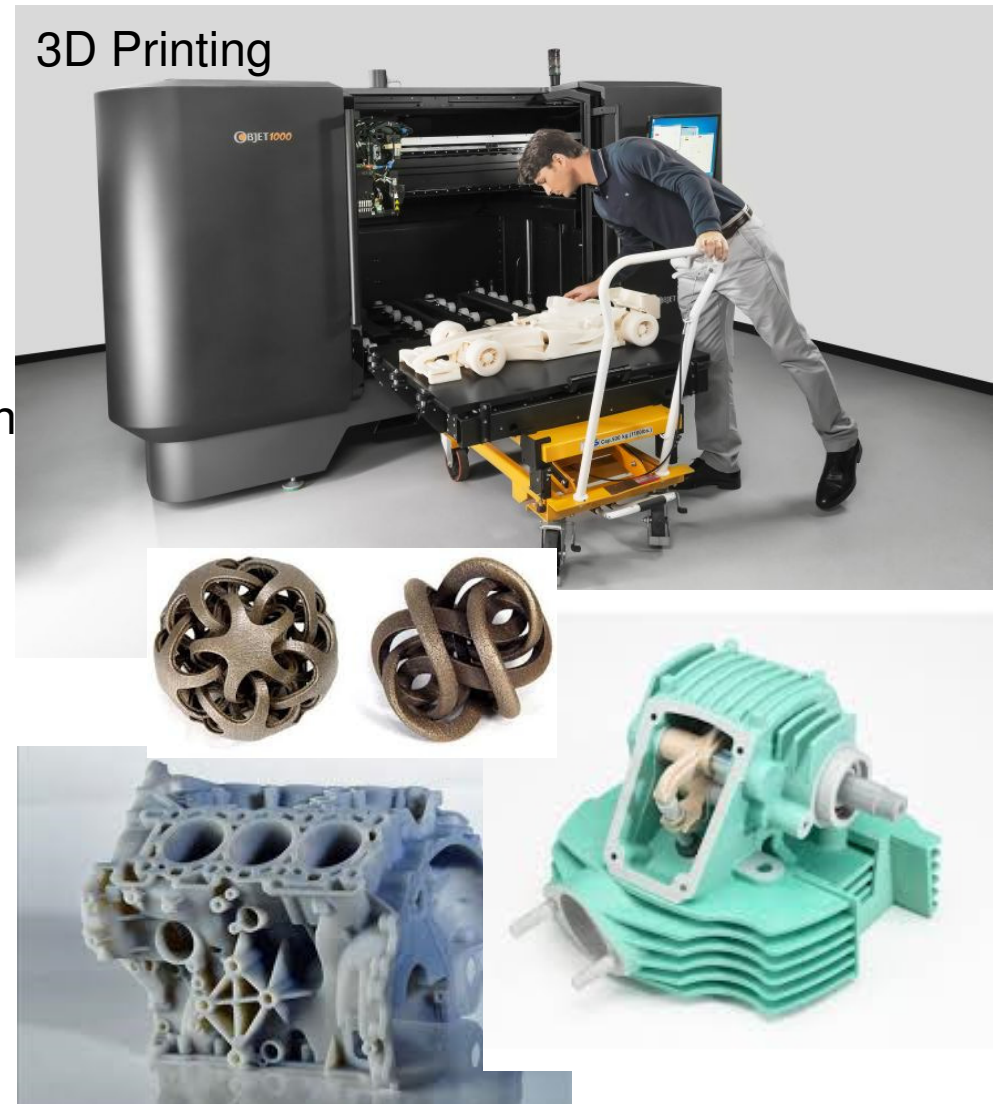
Example: delivery



Trend Solution Generation

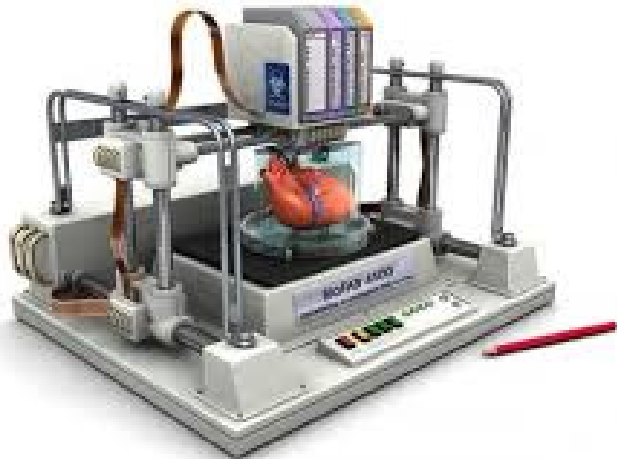
- Trend of Increasing Dynamization
 - Dynamic data transfer followed by “on-site” manufacturing
- Trend of Decreasing Human Involvement/Increasing System Completeness
 - System “delivers” freight when and where it is needed – customer driven
- Trend of Increasing Customer Expectations
 - Freight can be customized and delivered when and where most convenient to customer
- Trend of Increasing Action Coordination
 - Fully automated “shipping” (data) and assembly services

Example: delivery

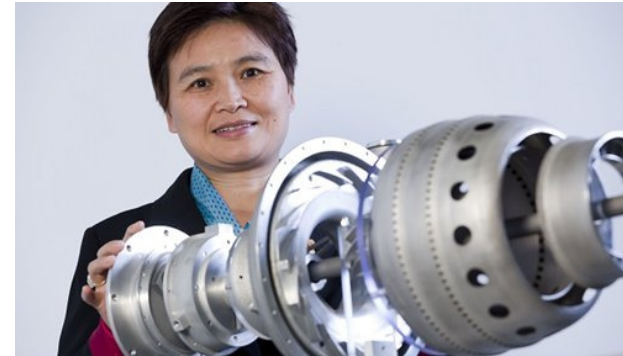




“OK, but the advancements are probably way off. Right”?

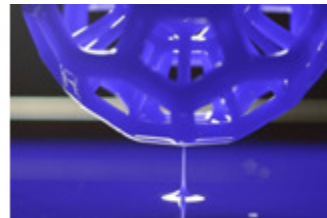


3D Printed Human Kidney



Monash University researchers along with collaborators from CSIRO and Deakin University have printed a jet engine.

3D Printed Jet Engine



UV Triggered Photopolymerization



3D Printed Soccer Cleats



3D Printed House

Last 24 Months of Advancements



Apple's iPhone: An Application of Systematic Innovation (SI) for Growth Strategy

David Conley, Technical Program Director, Intel Corp. / Innovation LLC

Arik Johnson, Founder & Chairman, Aurora WDC

Act 1 – iPhone: how it came to be, where will it go? – Systematic Innovation (SI) Analysis – 25 min.
Act 2 – Tasking Methodology (relevant CI data) – 25 min.
Act 3 – Theory Application – 40 min.

 AURORA WDC
SEE CLEARLY • THINK AHEAD • BREAK THROUGH

 Innovation
Systematic Technology and Business Innovation

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1

Q - “What’s to keep new technology from disrupting these trends”?

A – They were not created from a study of specific technologies or business practices but rather from the patterns of change reflected in the advancement of technology and business (i.e., meta-data)

SCIP 2011 Forecasting Exercise – Conley and Johnson

Smart Phone Technology Forecast Outcome Update:

- 1.) Jamming/offensive protection, inc. defensive protection
- 2.) All controls internal to phone operations
- 3.) Increase in unique functionality/3D connectivity
- 4.) Screen gets smaller while image gets bigger (retinal projection)



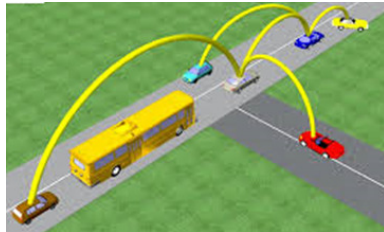
“OK, but the advancements are probably way off. Right”?

1.) Jamming/offensive protection, inc. defensive protection



Black Phone –
June 2014

2.) All controls internal to phone operations

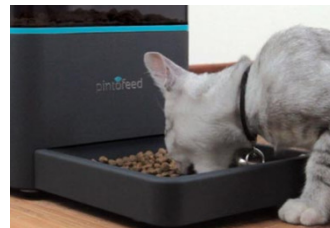


Car to Car Communications
(MIT Technology Review) –
March 2015

3.) Increase in unique functionality/3D connectivity



Pay by Phone –
Piloted 2011



Wi-Fi Pet Feeder
- 2014 est.



Wi-Fi Locks-
2013 est.

4.) Image gets bigger screen gets smaller (retinal projection)

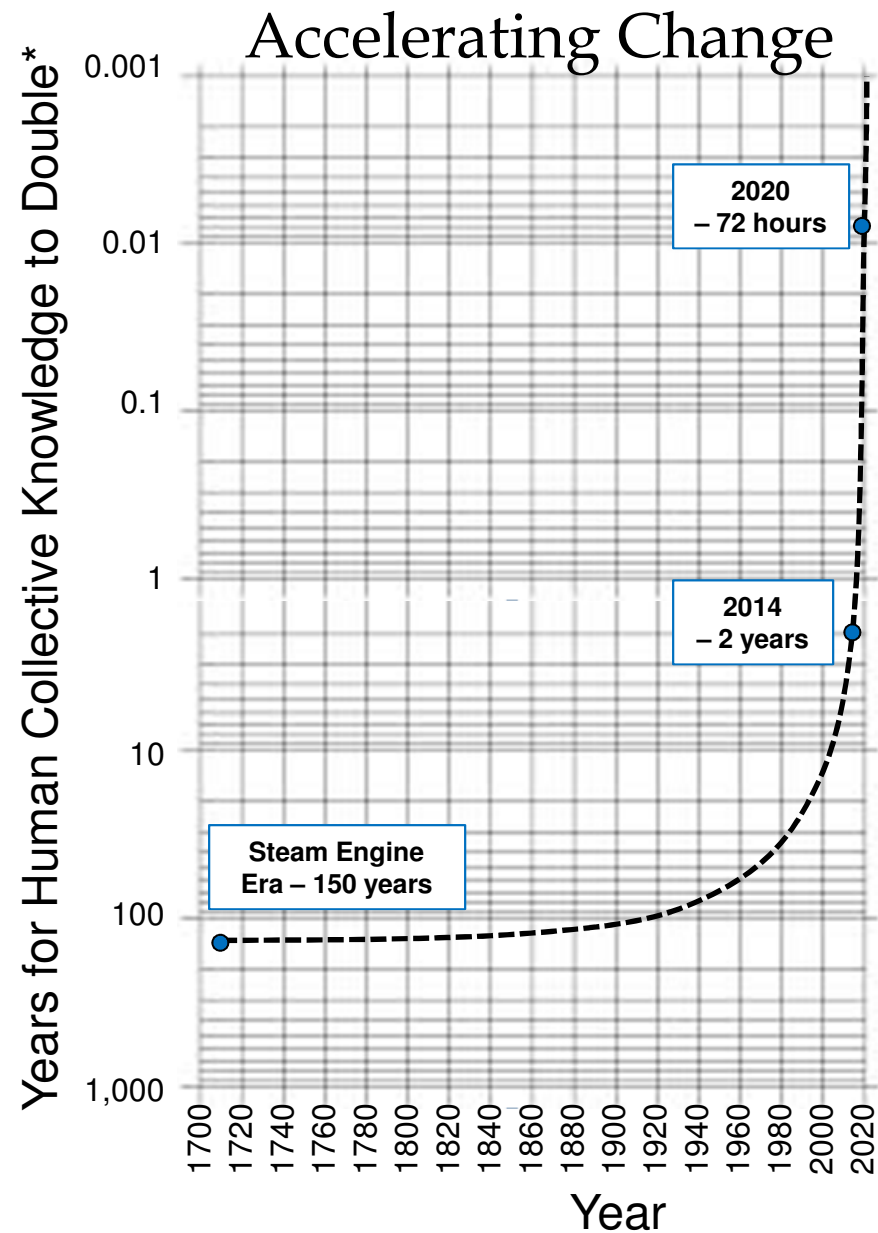
Retinal Projection (MIT
Technology Review) –
March 2015





Why is it important to perform technically guided forecasting?

Human knowledge is growing at an exponential rate. Any limitations you think exist today may very well not exist tomorrow. If you think the technology to create a change does not exist, do not wait long to recheck if it has been developed.



* Dolan, S. (Director). 2013 Big History of Everything (Television series episode). In B. Prady (Producer), *Big History*. New York: A&E Network



Current Usage in Industry

- **Systematic Innovation (TRIZ)**

- Strategic Planning and Forecasting
- Competitive Analysis and Positioning
- Product Development / Revolution
- Business Process Advancement
- Manufacturing Process Improvement
- Technical & Business Problem Resolution
- Wide Spread Usage:

- GE, Airbus, Samsung, Intel, Ford, NASA, many Chinese companies, P&G, Rolls-Royce, Telekom Malaysia, Hilti,



Back-Up



Additional Information - InnomationCorp.com

The screenshot shows the top section of the Innomation Corp website. At the top right are social media icons for LinkedIn, Twitter, and Facebook. The main header features the Innomation Corp logo on the left, which consists of a stylized 'C' with a red arrow pointing left, followed by the text 'INNOMATION CORP' in blue and 'Systematic Technology & Business Innovation' in a smaller font below it. To the right of the logo, the text 'AUTOMATIC INNOVATION FOR TECHNOLOGY AND BUSINESS' is displayed in white. Below the header is a navigation menu with buttons for 'What is Systematic Innovation?', 'About Us', 'Home', 'Clients & Recommendations', 'Products & Services', 'Articles/Presentations', and 'Contact Us'. The main banner area features a background image of a satellite in space, with a portion of an old map showing a sailing ship on the left. The text 'Do you know where your technology is headed?' is overlaid on the satellite. At the bottom of the banner, it says 'Exceptional innovation services for technical, computing and business systems. Trusted by the most influential players in industry.'



David Conley
President, Innovation Corp.

David Conley is President of Innovation Corporation, which he founded after leaving his post leading systematic innovation initiatives for 7 of his 17 years at global semiconductor manufacturing leader, Intel.

Connect with David via:

Web: <http://InnovationCorp.com>

Email: David@InnovationCorp.com

Phone: +01 505-206-3401

• **Education – BS Nuclear Engineering, MBA Finance, TRIZ L4**

• **Work Experience**

▶ US Air Force Philips Lab – R&D Officer

- Plasma Physical

- Space Based Nuclear Propulsion



▶ Johnson and Johnson – Process Engineer



▶ Phillips – Facilities Engineer **PHILIPS**

▶ Lockwood Greene – Engineering Consulting



▶ Intel Corporation – Engineering, Automation, Manufacturing, Finance, Management, Innovation



▶ Innovation Corp – Technical, Computing and Business Innovation Consulting