Speed, Data and Ecosystems:
Excelling in a Software-Driven World

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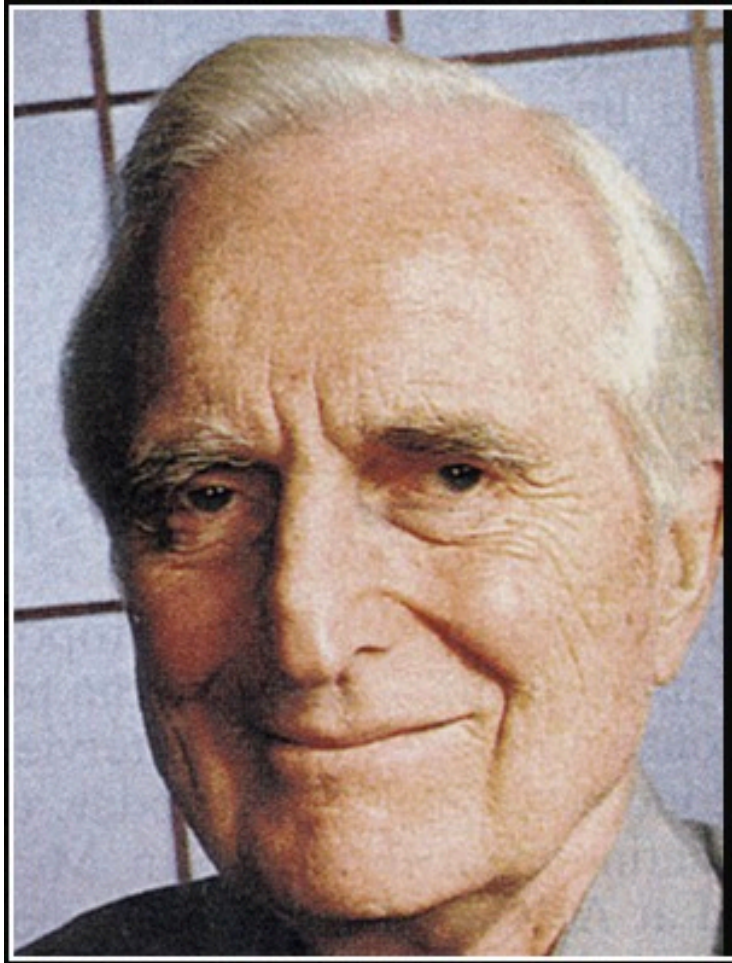
Keynote ICSOFT 2017, Madrid, July 2017



Fortune 500

Disruption Is The New Normal

- Jim Collins (Built to last): Companies last, on average, ~~30~~ ~~**15**~~ **10** years on the Fortune 500 list. And that time period is decreasing

- Main cause: Companies fail to innovate and to build new core capabilities

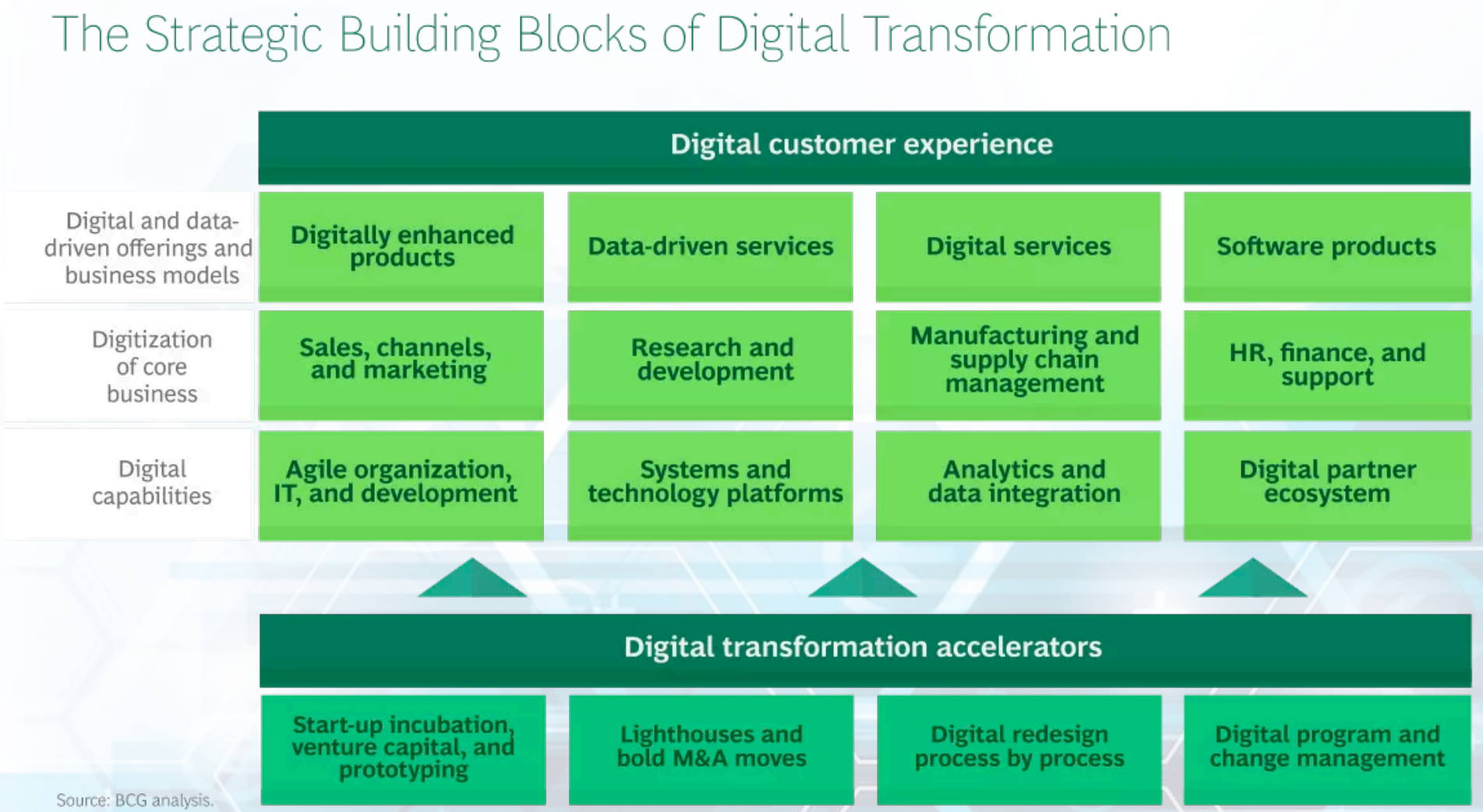
Digitalization Is The New Disruptor!

Digitalization

Digitalization is the use of digital technologies to change a **business model** and provide **new revenue** and **value-producing opportunities**; it is the process of moving to a **digital business**.

- Gartner

Digitalization



Three Key Take-Aways

- Increasing **SPEED** trumps ANY other improvement R&D can provide to the company – the goal is **continuous deployment** of new functionality
- Effective use of **DATA** from customers and products as well as the **ECOSYSTEMS** around your systems and services in the field are the next areas to exploit and monetize
- We are moving towards a new business operating mechanism focused on **EMPOWERMENT** and **autonomy**

Overview

- Vem är jag? Wie ben ik? Who am I?
- Trends in Industry: Need for Speed
- Towards a New Business Operating System
  - Speed
  - Data
  - Ecosystems
  - Empowerment
- Conclusion

Academic Research

10X Software Center

Software Center

Consultancy

ERICSSON BOSCH SIEMENS BASF The Chemical Company

GRUNDFOS SONY make.believe JEPPESEN A BOEING COMPANY THALES

VARIAN medical systems AirTies wireless networks transmode SEB

Startups

fidesmo Remente

Burt. AUQTUS Automated Quality Testing of User Scenarios

Industry Innovation

intuit NOKIA

PELTARION ASSIA

Industry Operations

NOKIA

Software Center

Mission: Improve the software engineering capability of the European Software-Intensive industry with an order of magnitude

Theme: Fast, continuous deployment of customer value

Success: Academic excellence

Success: Industrial impact

CHALMERS

MALMÖ UNIVERSITY

MÄLARDALEN UNIVERSITY
SWEDEN

Tetra Pak

SAAB TECHNOLOGIES

SIEMENS

BOSCH

qamcom

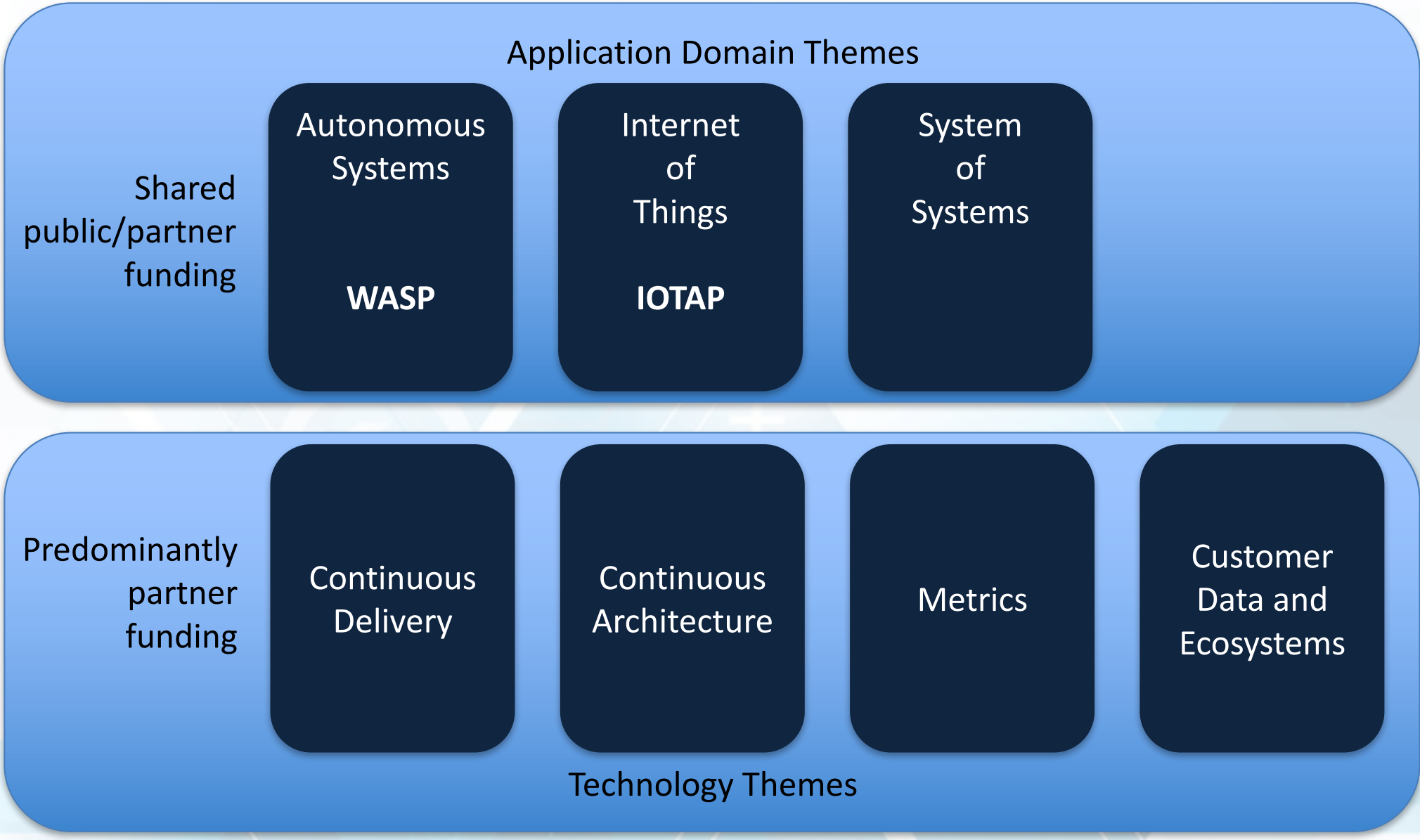
AXIS COMMUNICATIONS

JEPPESEN
A BOEING COMPANY

ERICSSON

GRUNDFOS

Research Themes



Some Online Companies

Klarna
Simplifying Buying

bing

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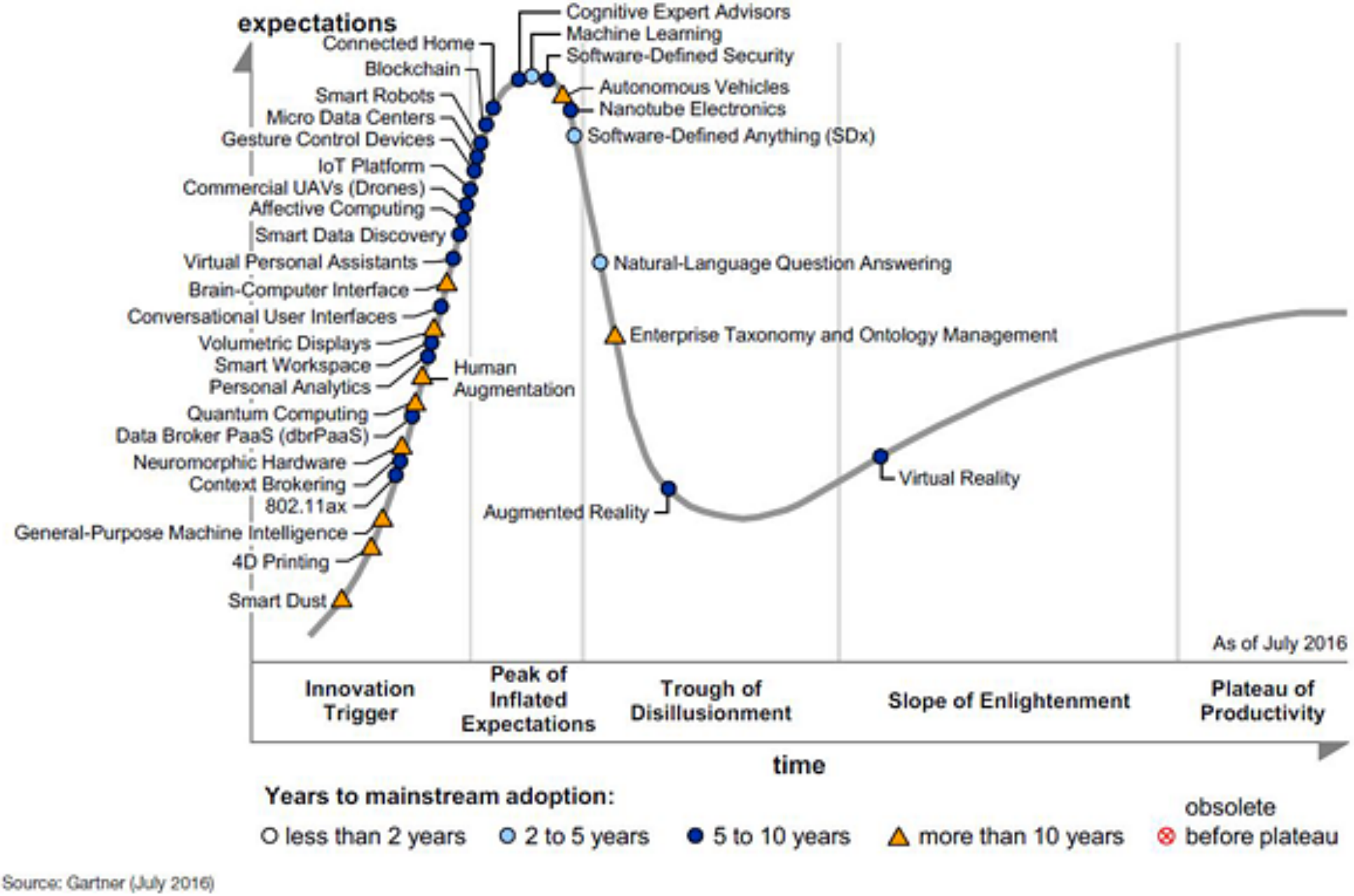
Gartner 2016 Technology Hype Cycle



Source: Gartner (July 2016)

Wildly combinatorial streams of digital transformation

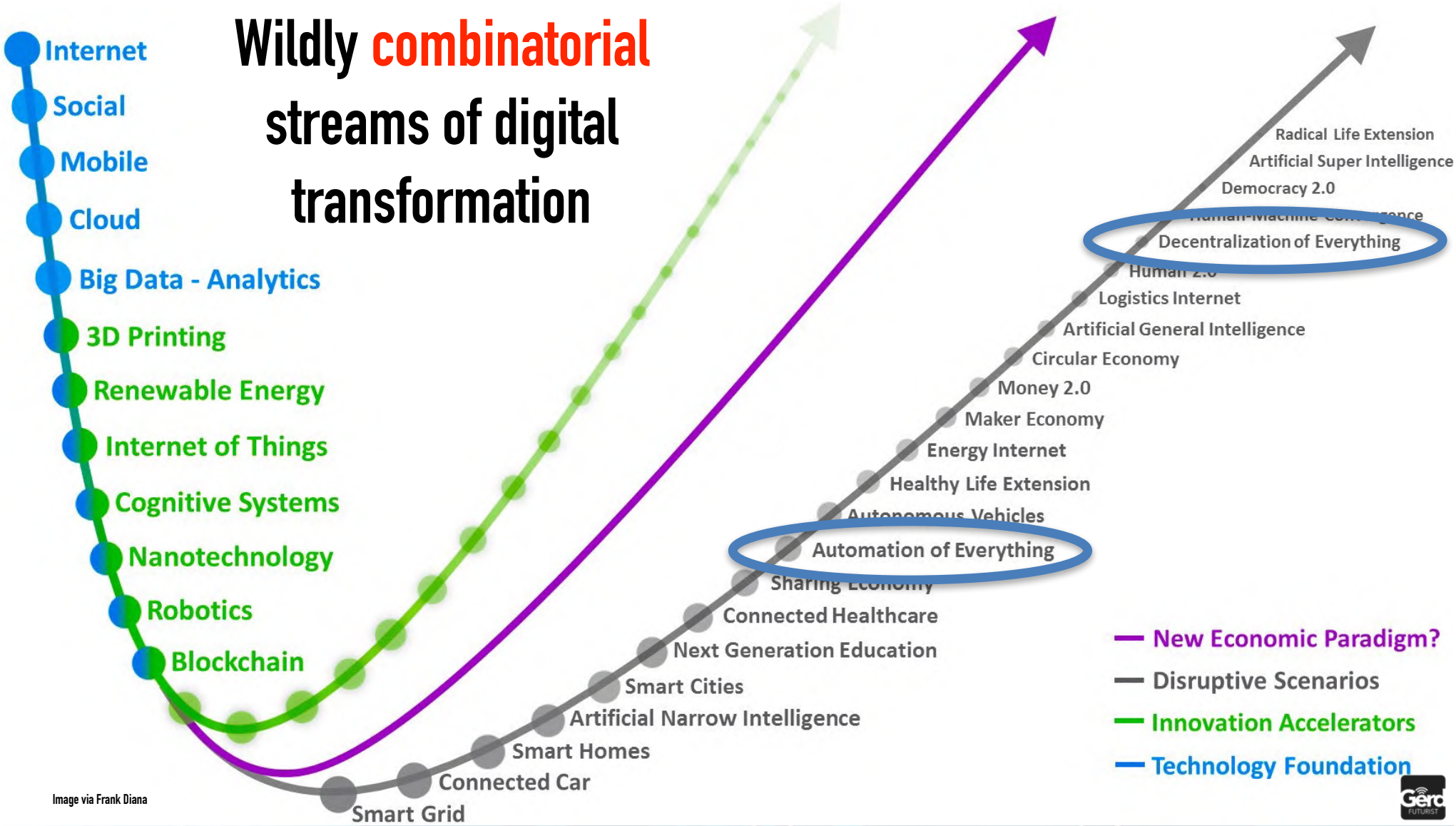
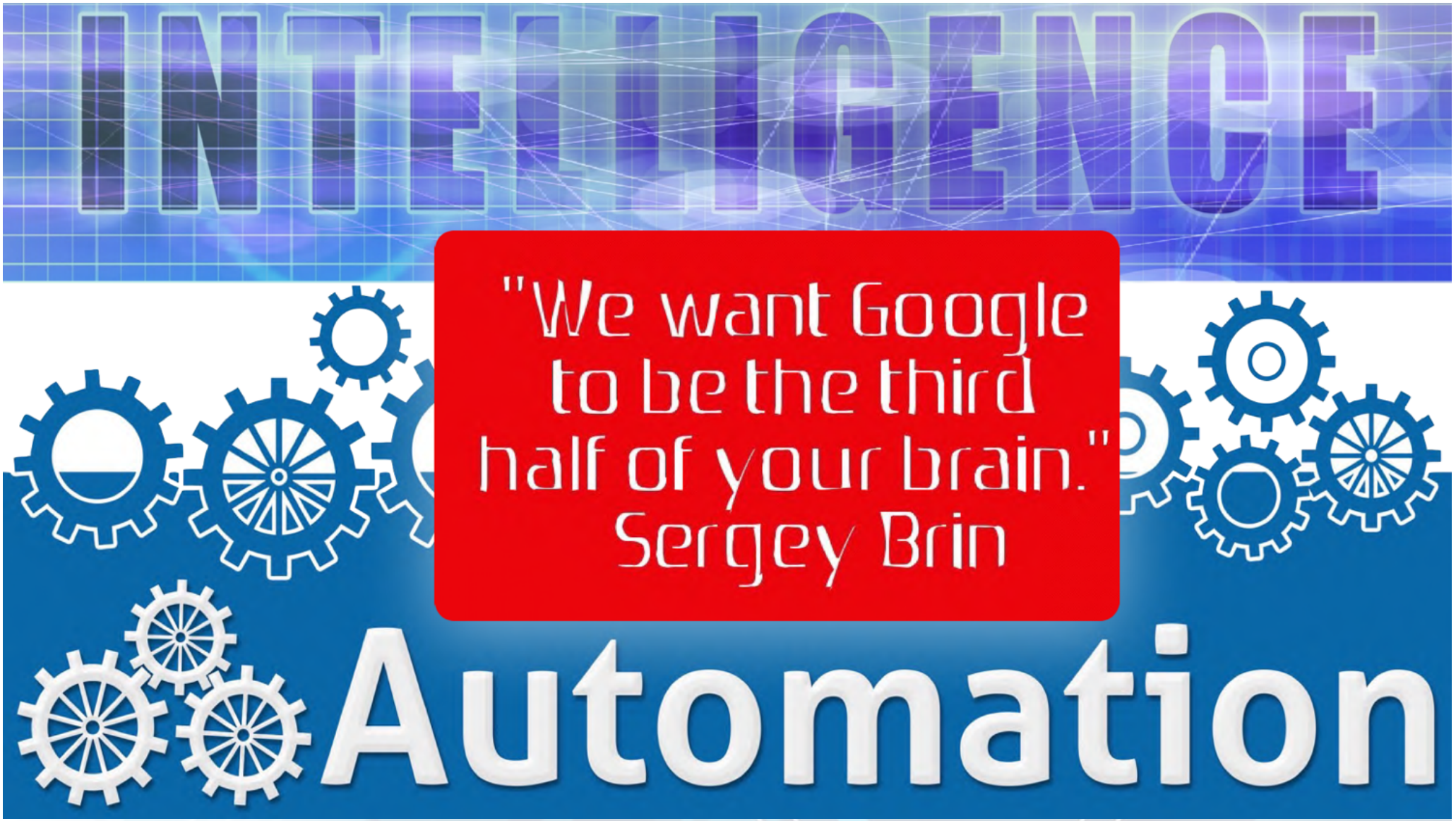
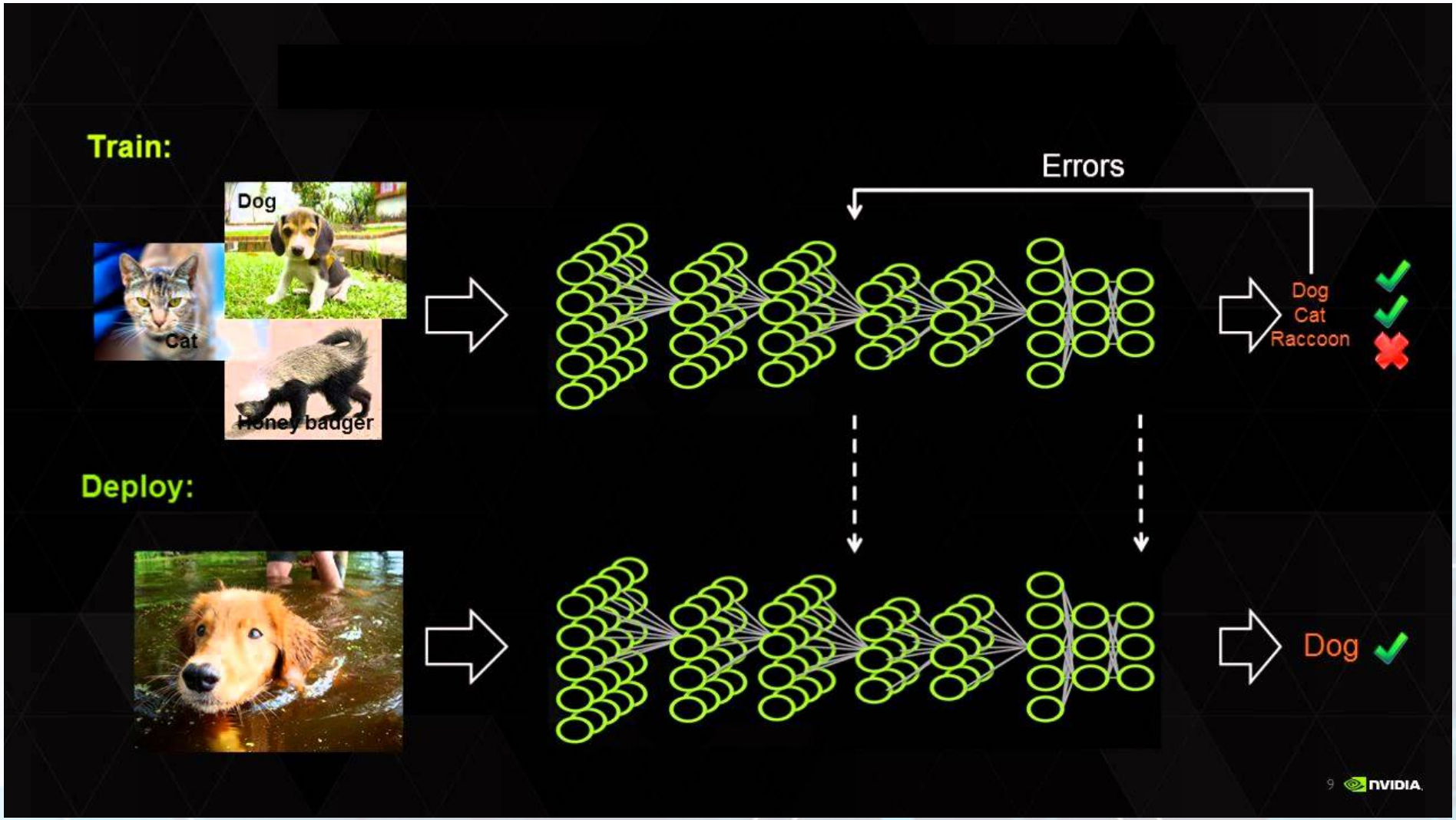


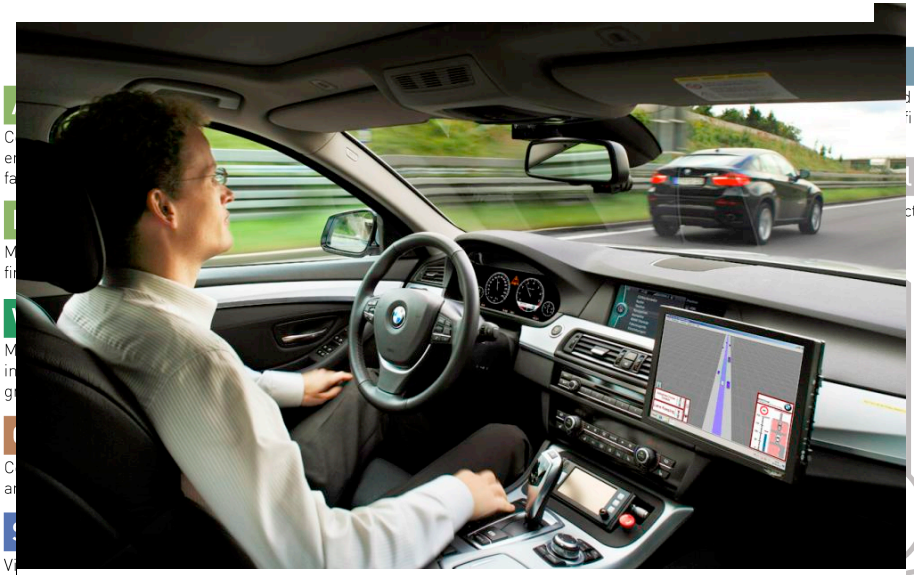
Image via Frank Diana


INTELLIGENCE
"We want Google to be the third half of your brain."
Sergey Brin
Automation

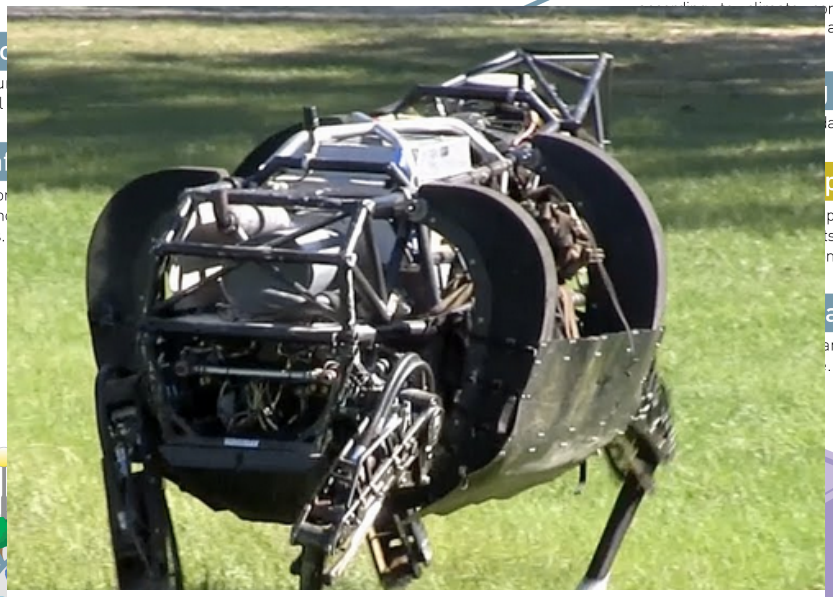
Deep Learning



Software Drives Everything

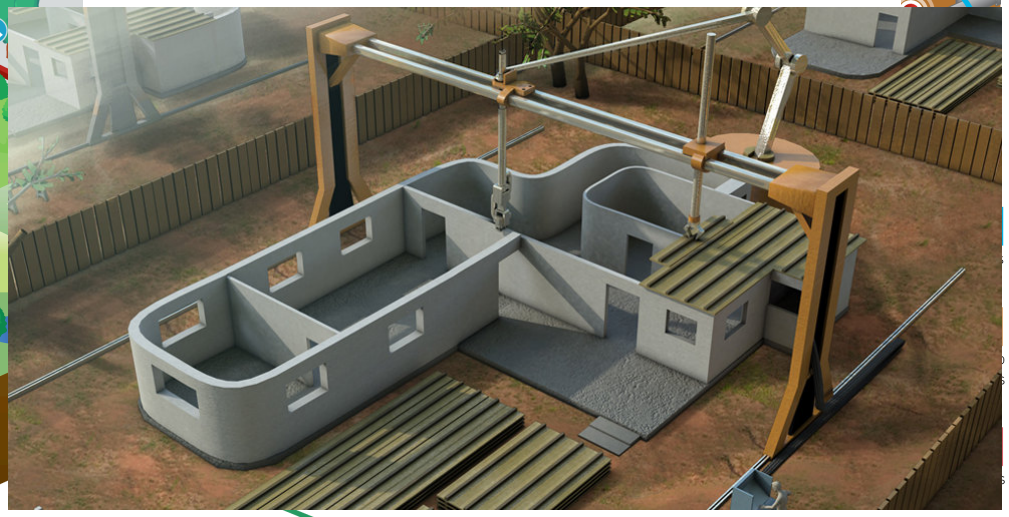


Self-Driving Cars



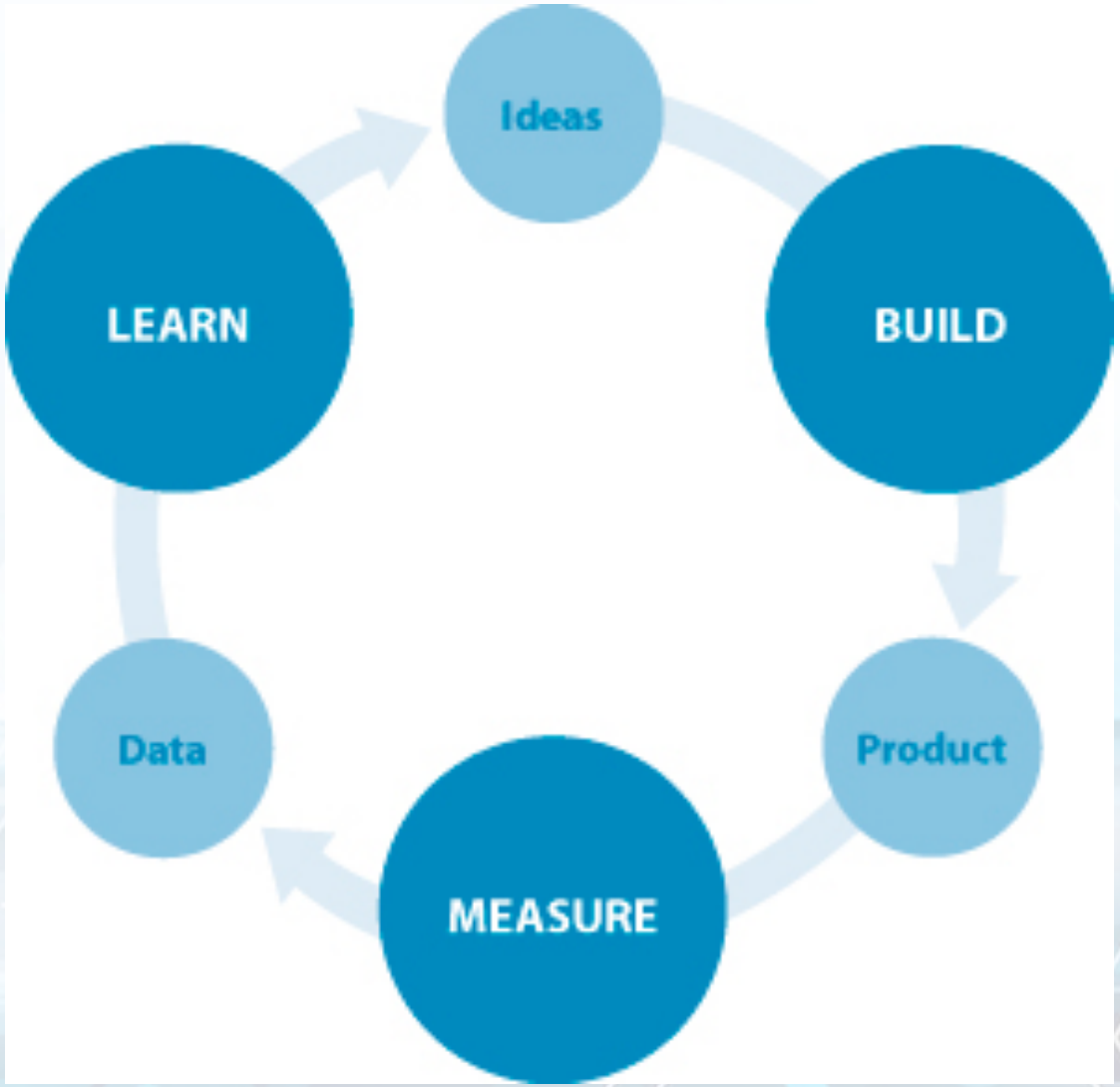
Robots

Gripen Drone



3D Cement Printing

The Cycle of Innovation



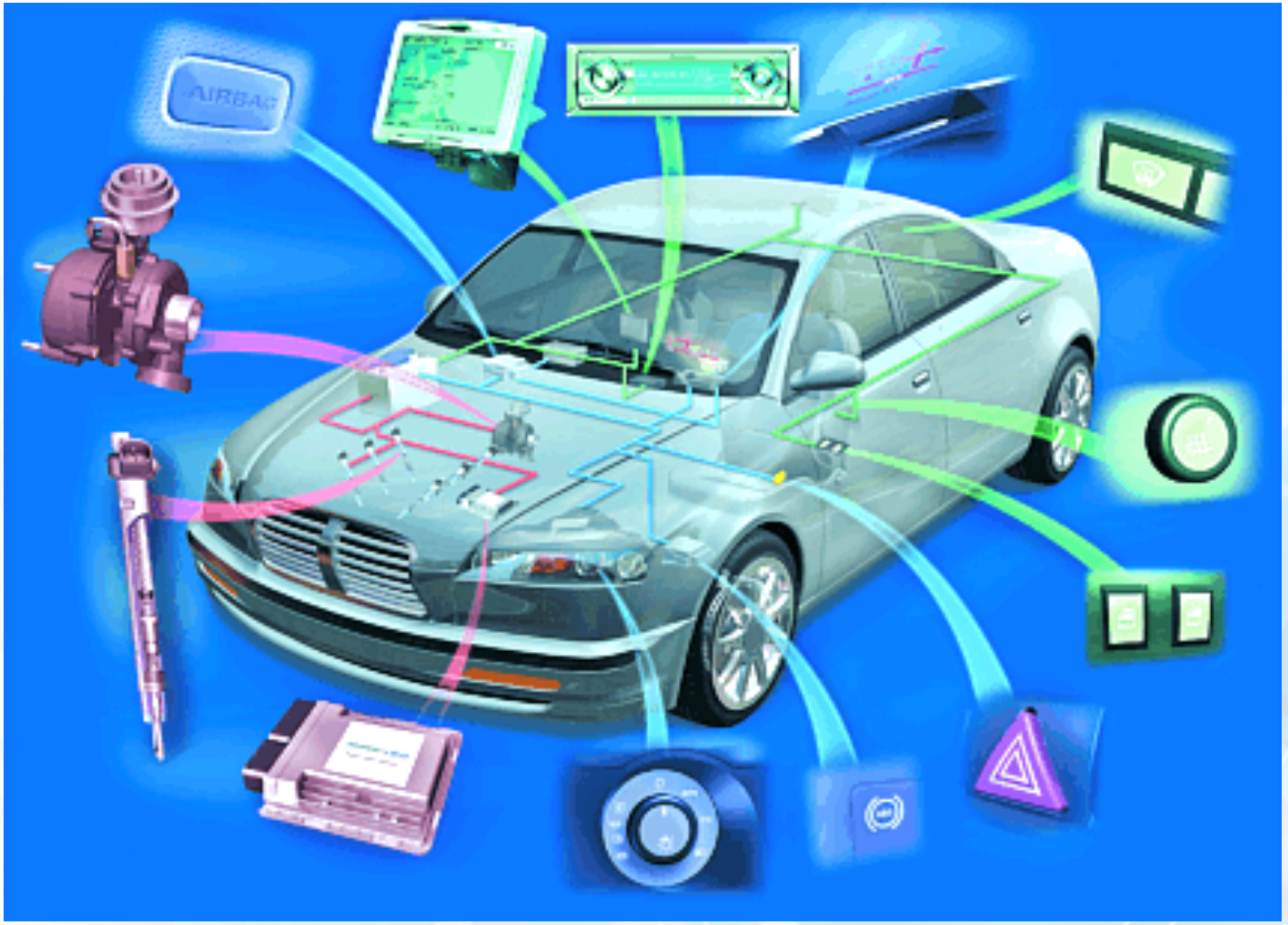
Length of Innovation Cycle

Car Platform: 10-15 years

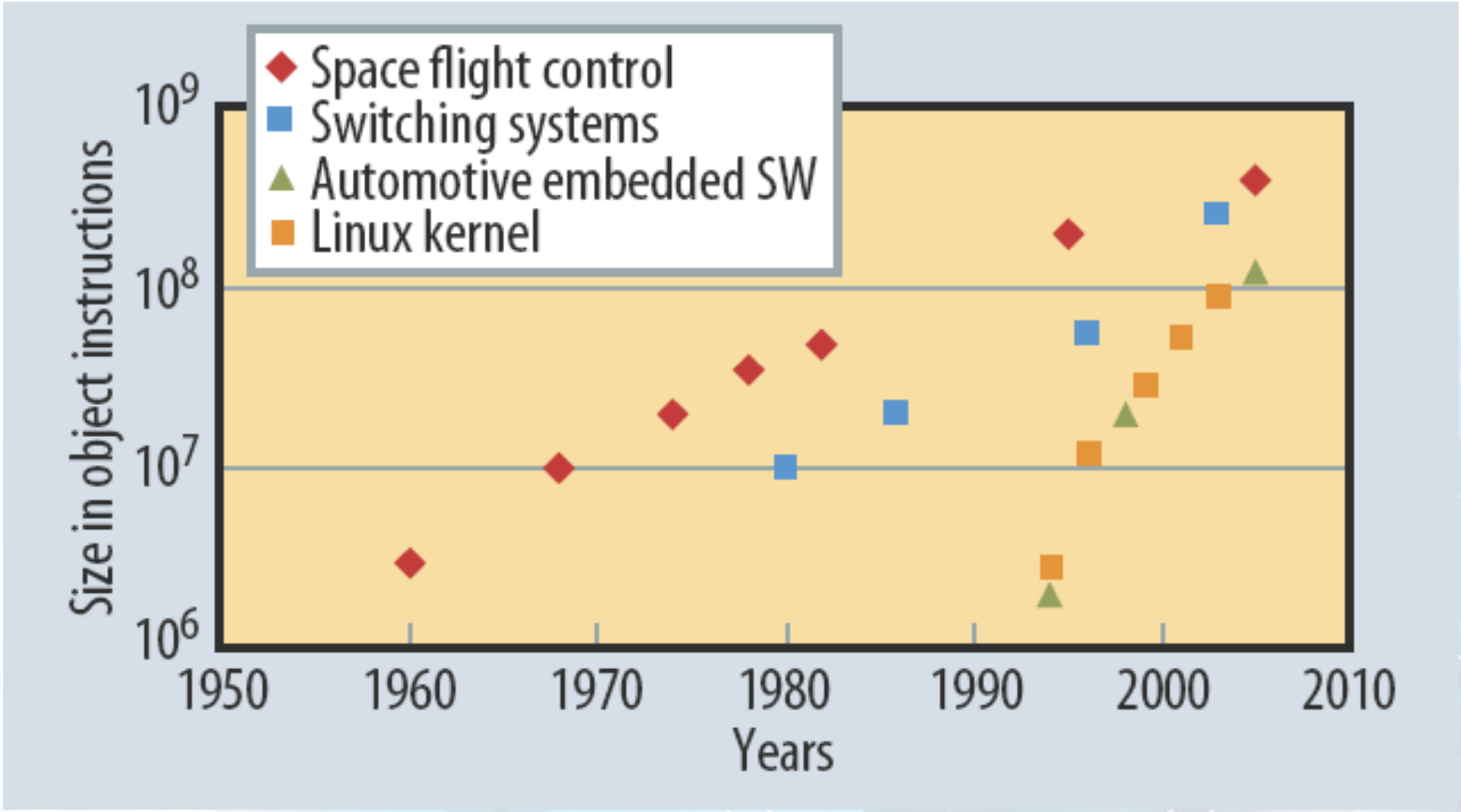
Length of Innovation Cycle

Car: 3-4 years

Length of Innovation Cycle

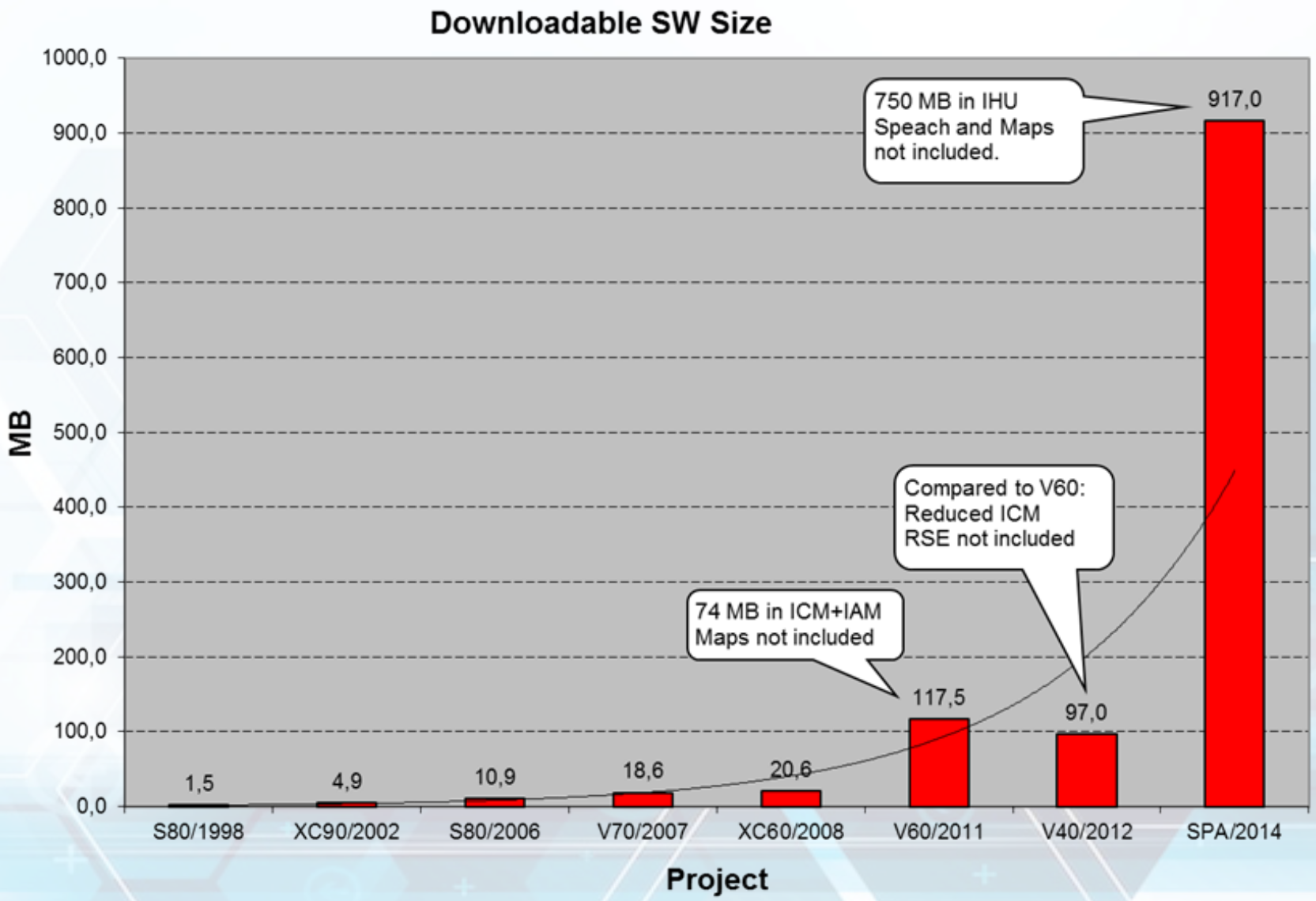


Car Software: 1-5 days

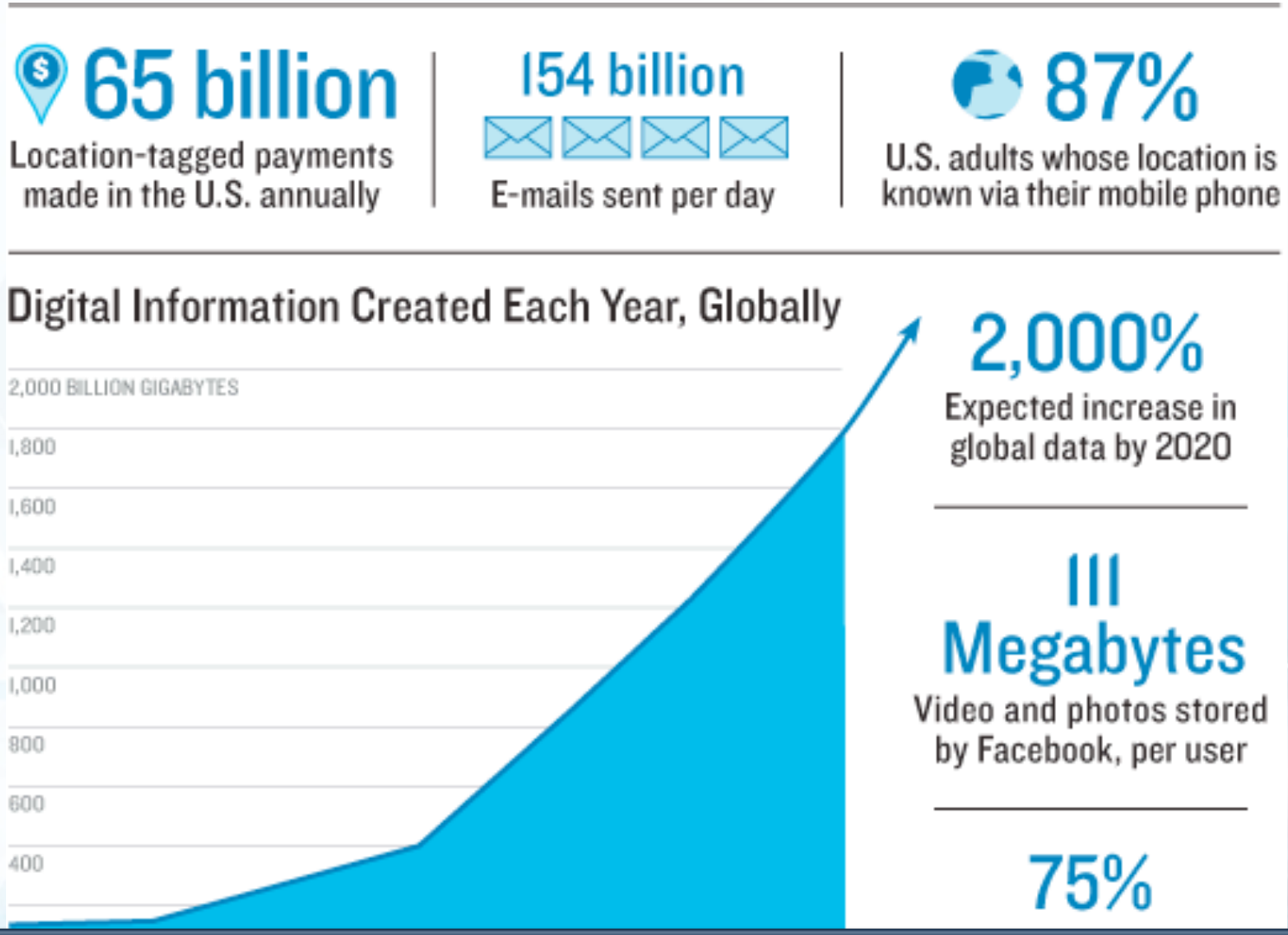


10x every ~7 years

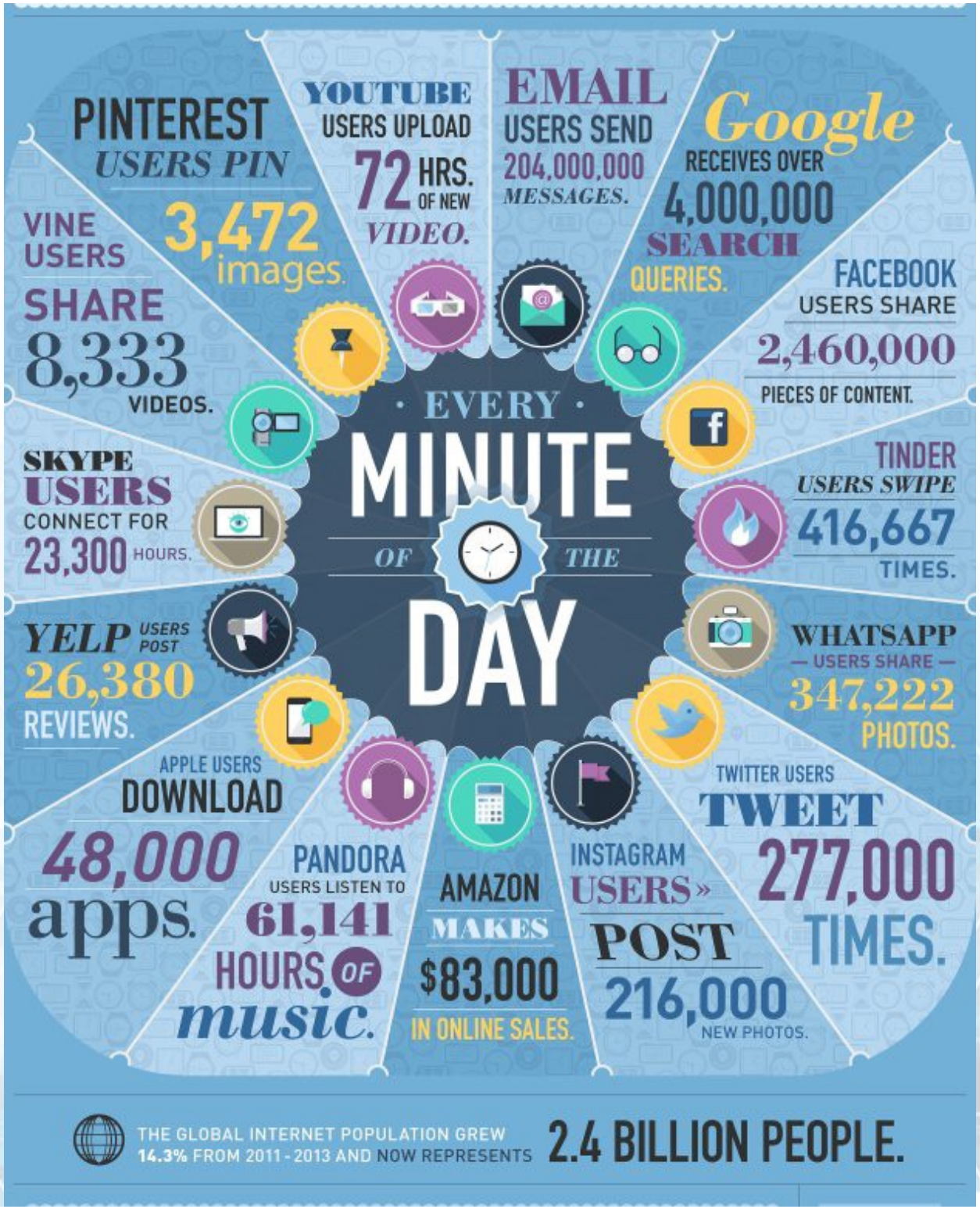
Volvo XC 90


Downloadable SW Size
MB
1000,0
900,0
800,0
700,0
600,0
500,0
400,0
300,0
200,0
100,0
0,0
750 MB in IHU
Speach and Maps
not included.
917,0
Compared to V60:
Reduced ICM
RSE not included
74 MB in ICM+IAM
Maps not included
117,5
97,0
1,5
4,9
10,9
18,6
20,6
S80/1998
XC90/2002
S80/2006
V70/2007
XC60/2008
V60/2011
V40/2012
SPA/2014
Project

Data Generated in the World



50 Terabytes of data are created every second


PINTEREST
USERS PIN
3,472 images.
YOUTUBE
USERS UPLOAD
72 HRS. OF NEW
VIDEO.
EMAIL
USERS SEND
204,000,000
MESSAGES.
Google
RECEIVES OVER
4,000,000
SEARCH
QUERIES.
VINE
USERS
SHARE
8,333
VIDEOS.
FACEBOOK
USERS SHARE
2,460,000
PIECES OF CONTENT.
· EVERY ·
MINUTE
OF THE
DAY
SKYPE
USERS
CONNECT FOR
23,300 HOURS.
TINDER
USERS SWIPE
416,667
TIMES.
YELP USERS POST
26,380
REVIEWS.
WHATSAPP
— USERS SHARE —
347,222
PHOTOS.
APPLE USERS
DOWNLOAD
48,000
apps.
PANDORA
USERS LISTEN TO
61,141
HOURS OF
music.
AMAZON
MAKES
$83,000
IN ONLINE SALES.
INSTAGRAM
USERS »
POST
216,000
NEW PHOTOS.
TWITTER USERS
TWEET
277,000
TIMES.
THE GLOBAL INTERNET POPULATION GREW
14.3% FROM 2011 - 2013 AND NOW REPRESENTS
2.4 BILLION PEOPLE.

Trend: Need for Speed

Value Creation Shifts

Emerging companies highlight importance
of user contribution and social connectedness

Level of User Contribution

Founded	1984	1995	2004	2009
1M users	~6 years	30 months	10 months	?
50M users	N/A	~80 months	~44 months	~ 1 month

Need for Speed in R&D – An Example

- Company X: R&D is **10%** of revenue, e.g. 100M$ for a 1B$ product
- New product development cycle: **12 months**

- Alternative 1: improve efficiency of development with 10%
  - **10 M$** reduction in development cost
- Alternative 2: reduce development cycle with 10%
  - **100M$** add to top line revenue (product starts to sell 1.2 months earlier)

No efficiency improvement will outperform cycle time reduction

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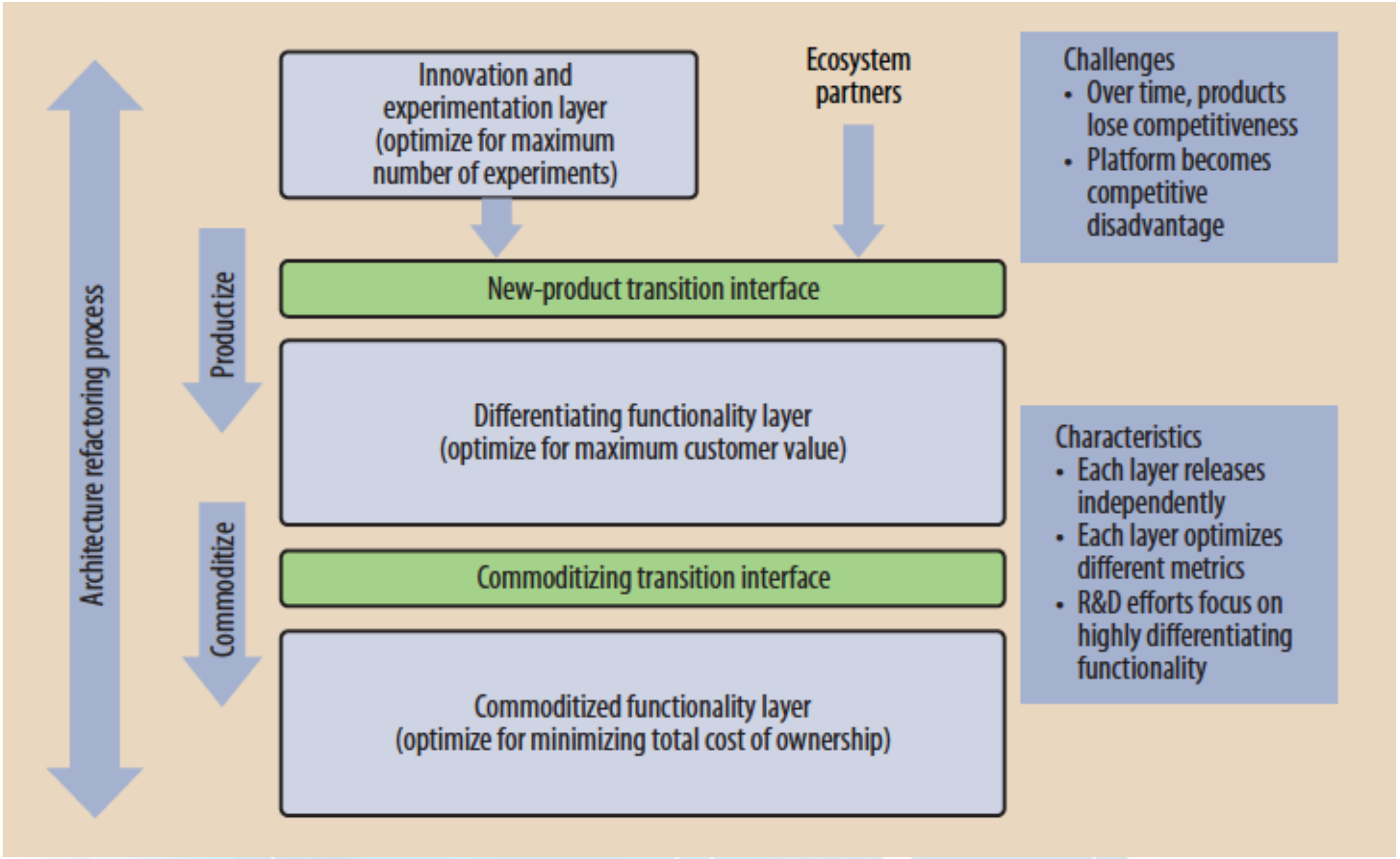
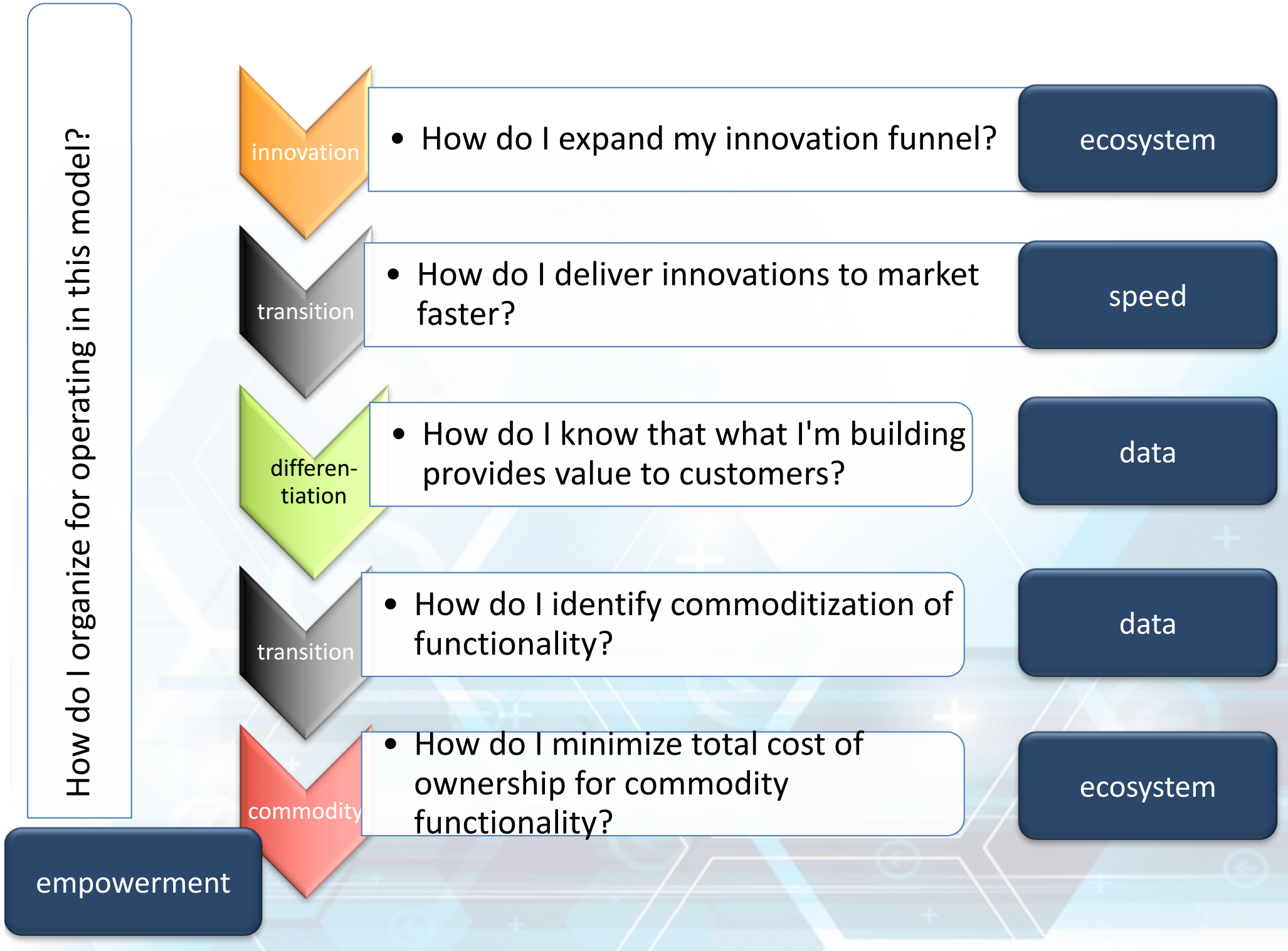
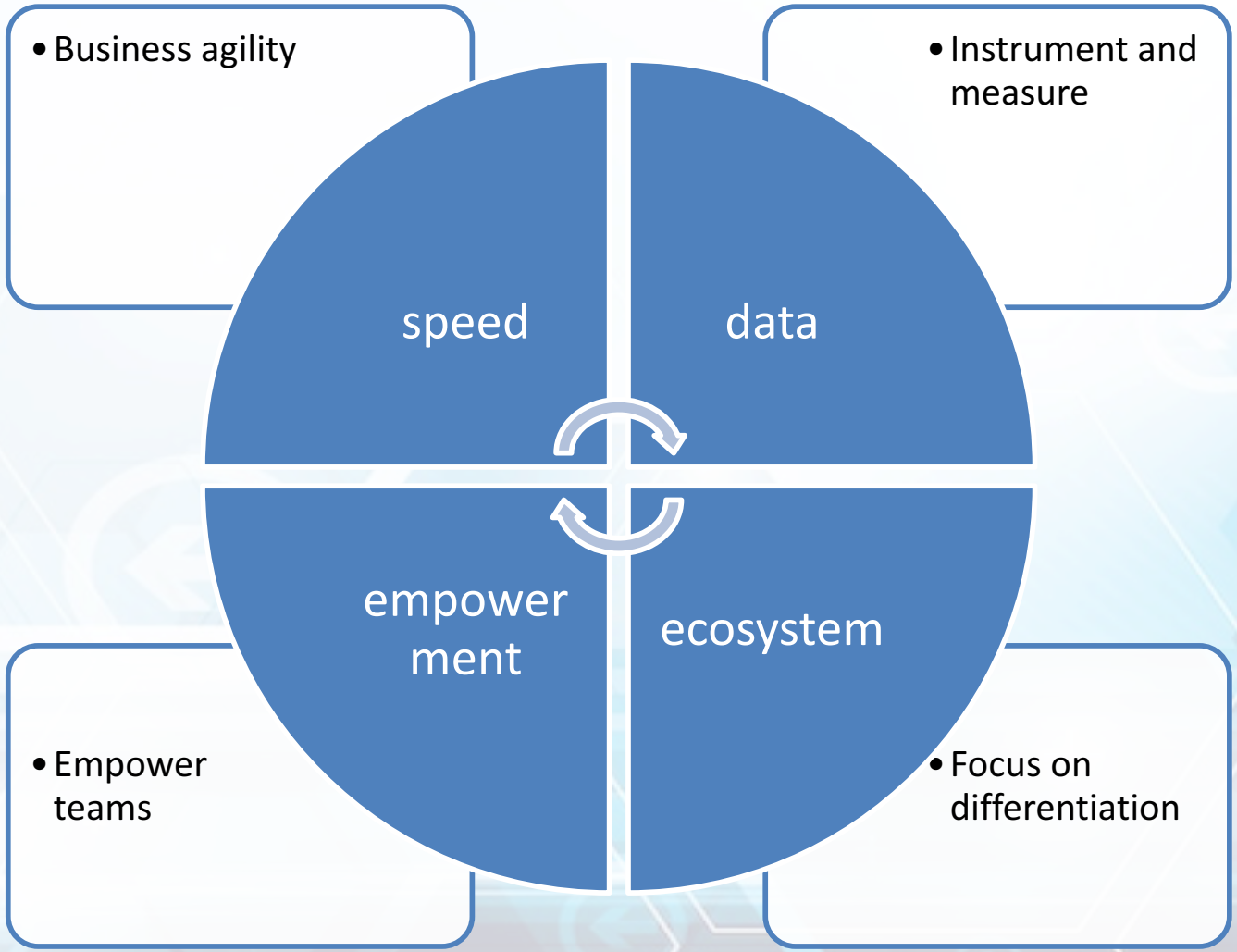
3LPM: Three Layer Product Model



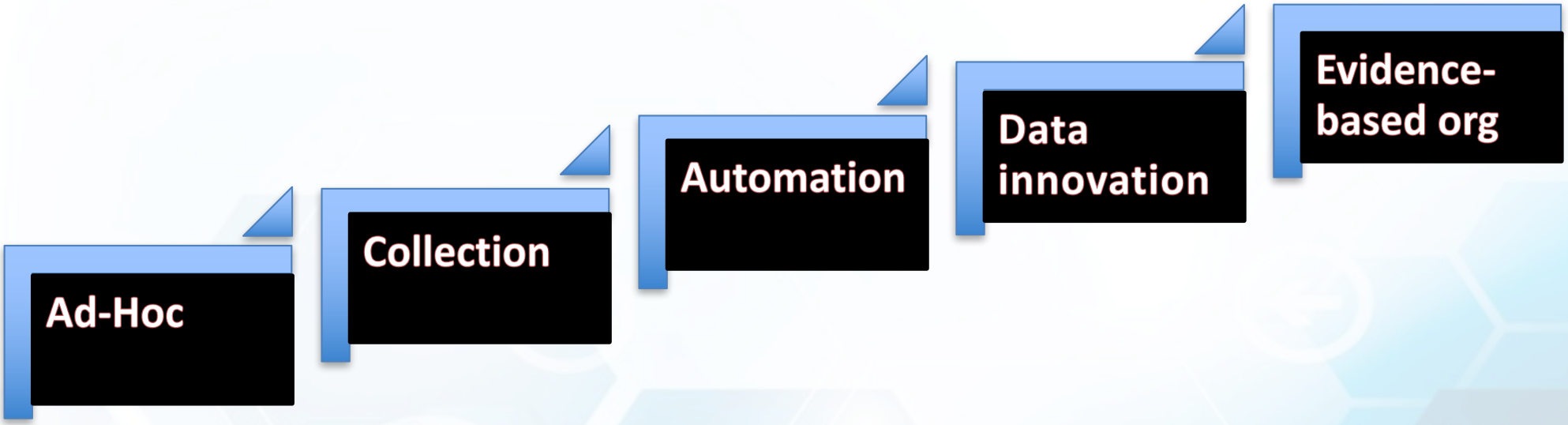

How do I organize for operating in this model?
innovation
• How do I expand my innovation funnel?
ecosystem
transition
• How do I deliver innovations to market faster?
speed
differen-tiation
• How do I know that what I'm building provides value to customers?
data
transition
• How do I identify commoditization of functionality?
data
commodity
• How do I minimize total cost of ownership for commodity functionality?
ecosystem
empowerment

A New Business Operating System



Stairway to Heaven: Speed

Stairway to Heaven: Data

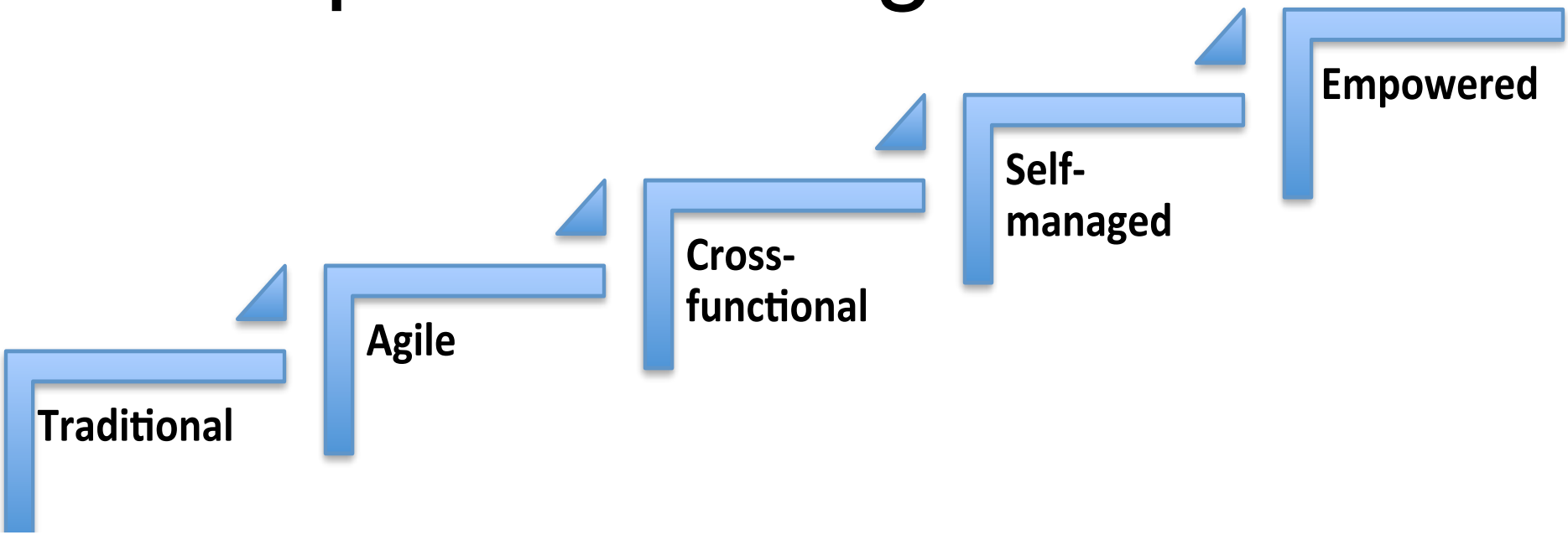


	Collection	Analysis	Reporting	Decision making
Ad-hoc	manual	manual	manual	manual
Collection	automated	manual	manual	manual
Automation	automated	automated	automated	supported
Data innovation	dynamic	dynamic	dynamic	supported
Evidence-based company	dynamic	dynamic	dynamic	automated

Stairway to Heaven: Ecosystems

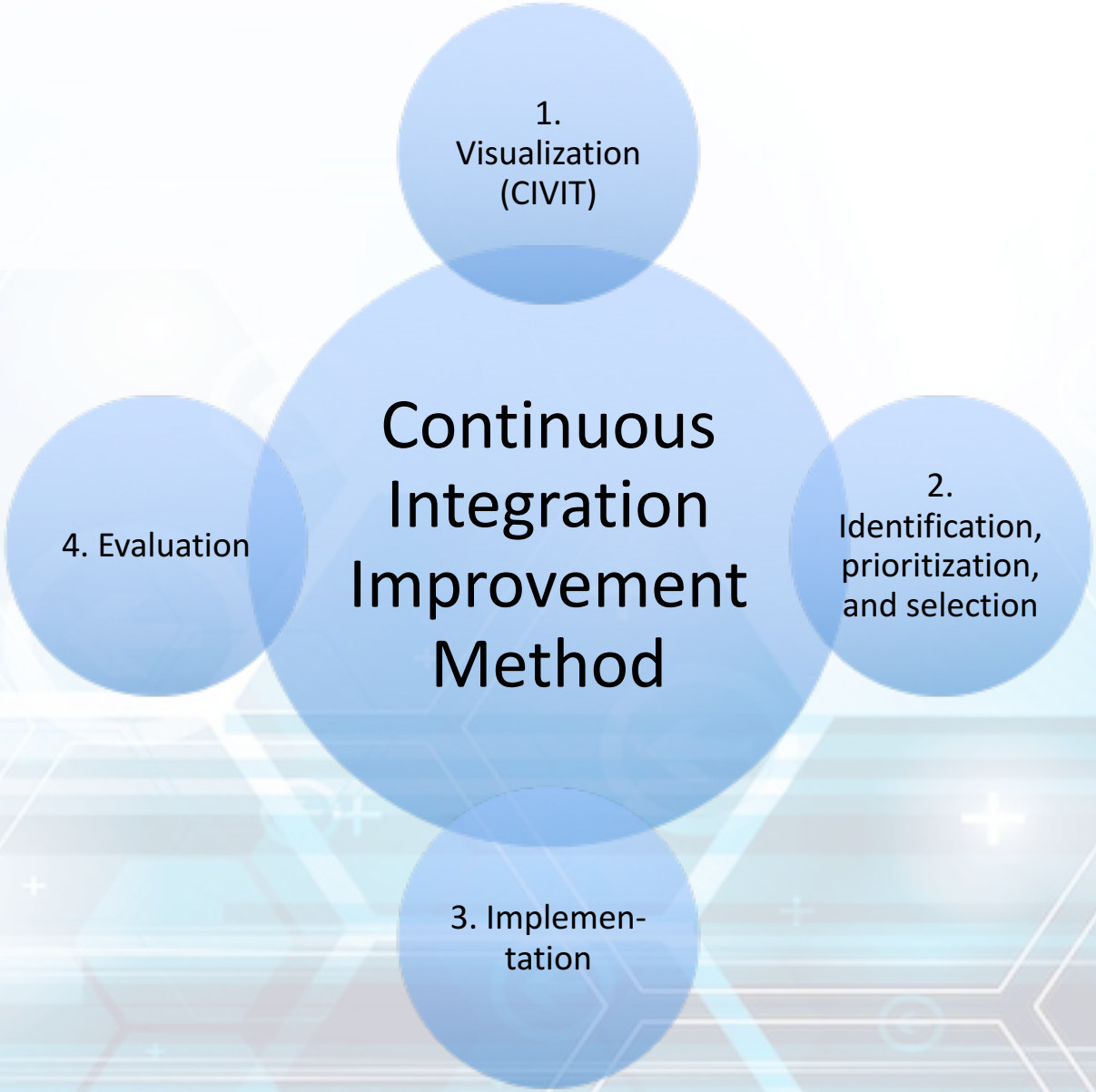
Levels	
Internally focused	do everything in-house unless it is really impossible
Ad-hoc ecosystem engagement	individuals take ad-hoc decisions to engage with ecosystem partners, but local optimization
Tactical ecosystem engagement	ecosystem engagement is centralized, but driven by tactical (rather than strategic) considerations
Strategic single ecosystem management	one of the ecosystem types is managed strategically
Strategic multi-ecosystem management	all three types (I, D, C) are managed strategically

Empowered Organizations

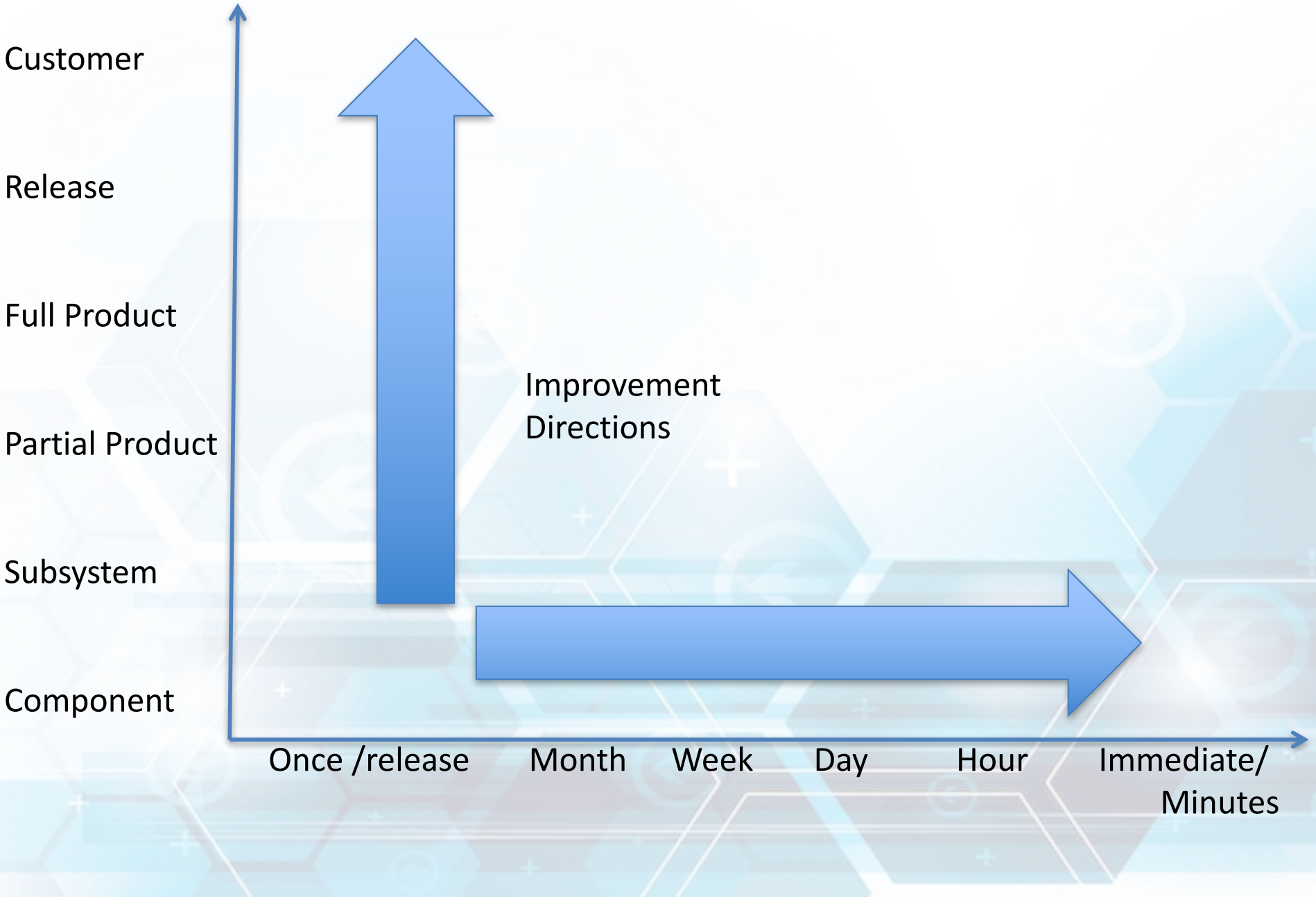


	Traditional	Agile	Cross-functional	Self-managed	Empowered
Culture	Hierarchical	Hierarchical	Hierarchical	Hierarchical	Empowered
General Mgmt.	Hierarchical	Hierarchical	Hierarchical	Empowered	Empowered
Inter-team (PdM/R&D)	Hierarchical	Hierarchical	Empowered	Empowered	Empowered
Local (R&D)	Hierarchical	Empowered	Empowered	Empowered	Empowered

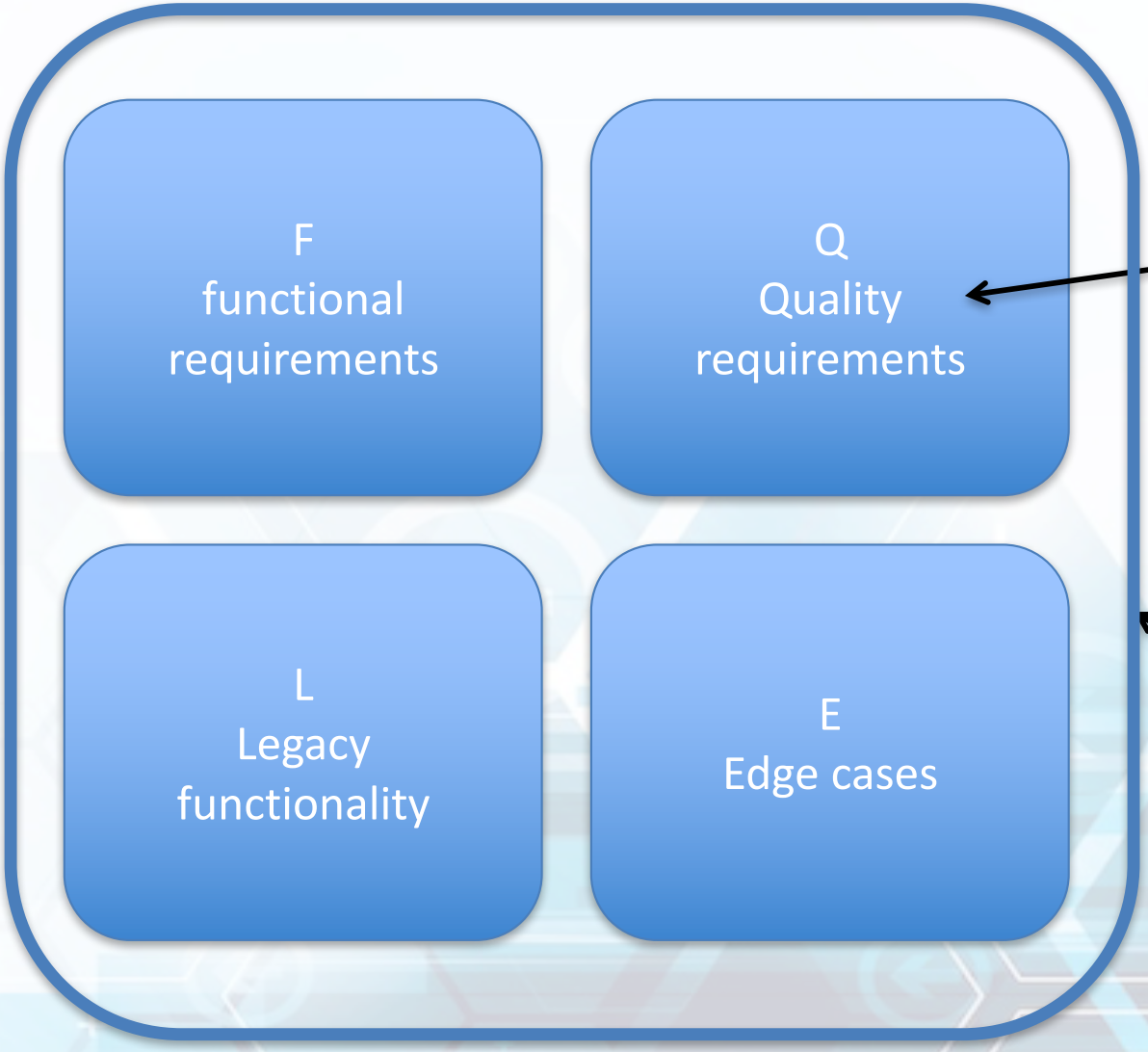
CItIM


1. Visualization (CIVIT)
Continuous Integration Improvement Method
2. Identification, prioritization, and selection
3. Implemen-tation
4. Evaluation

The CIVIT Model



Legend



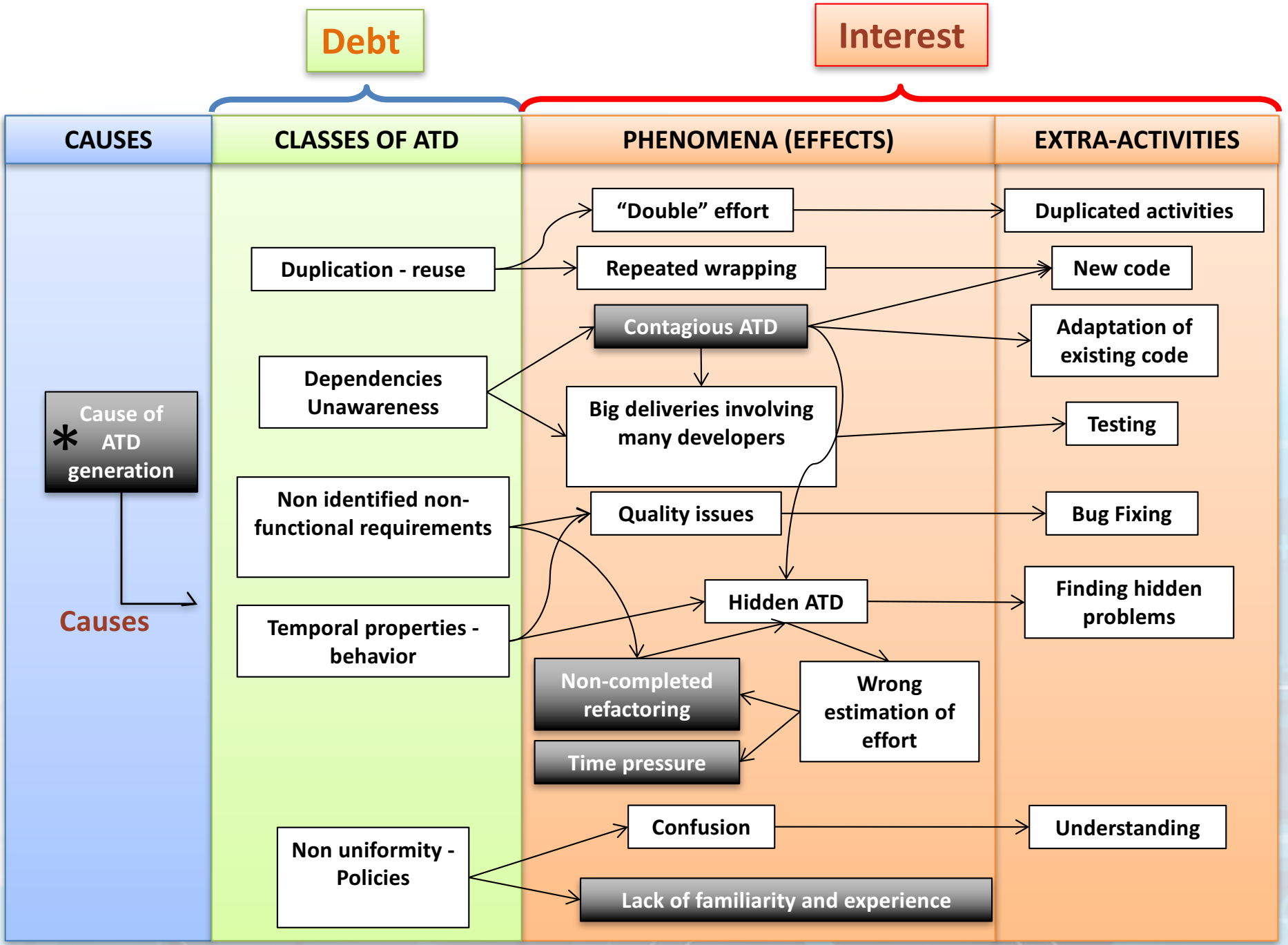
Complete coverage
Significant testing 70% < coverage < 95%
Partial testing 30% < coverage < 70%
Some testing but less than 30% coverage
No testing of this type at all

Coverage for each type of testing

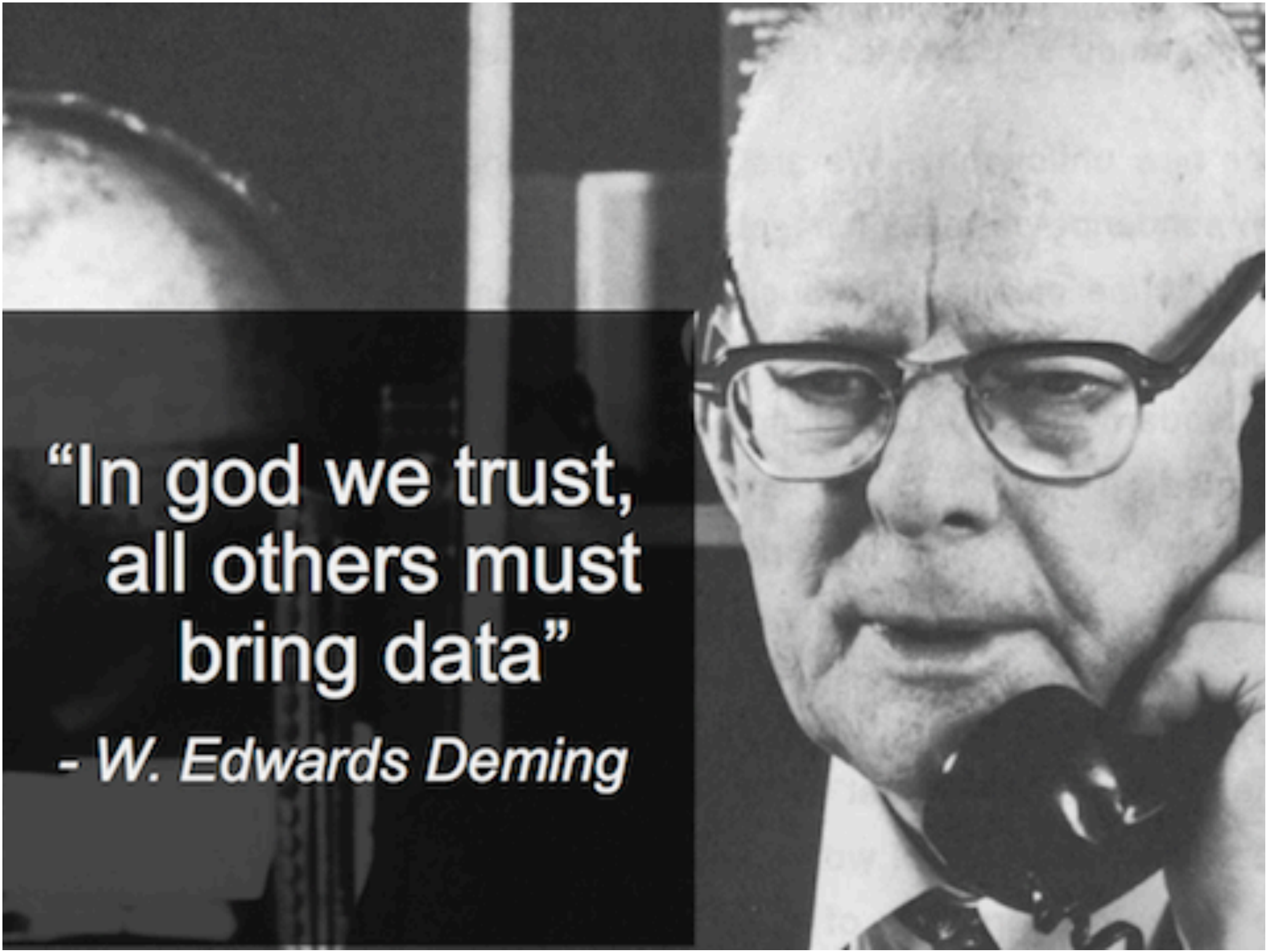
Level of test automation

Fully automated
Significant automation, between 70 and 95%
Partial automation, between 30 and 70%
Some automation, less than 30%
No automation at all

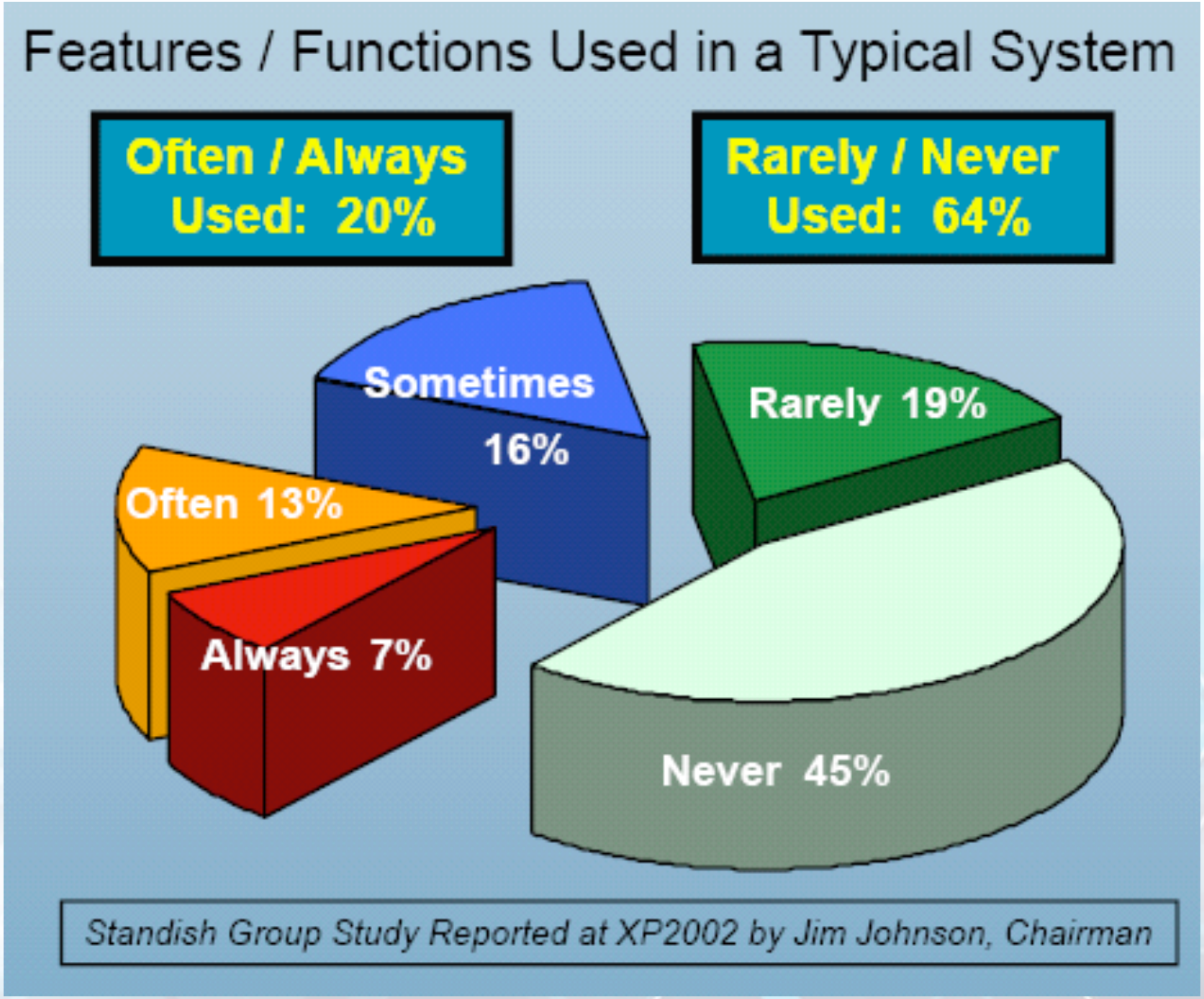
CIVIT: Continuous Integration Visualization Technique



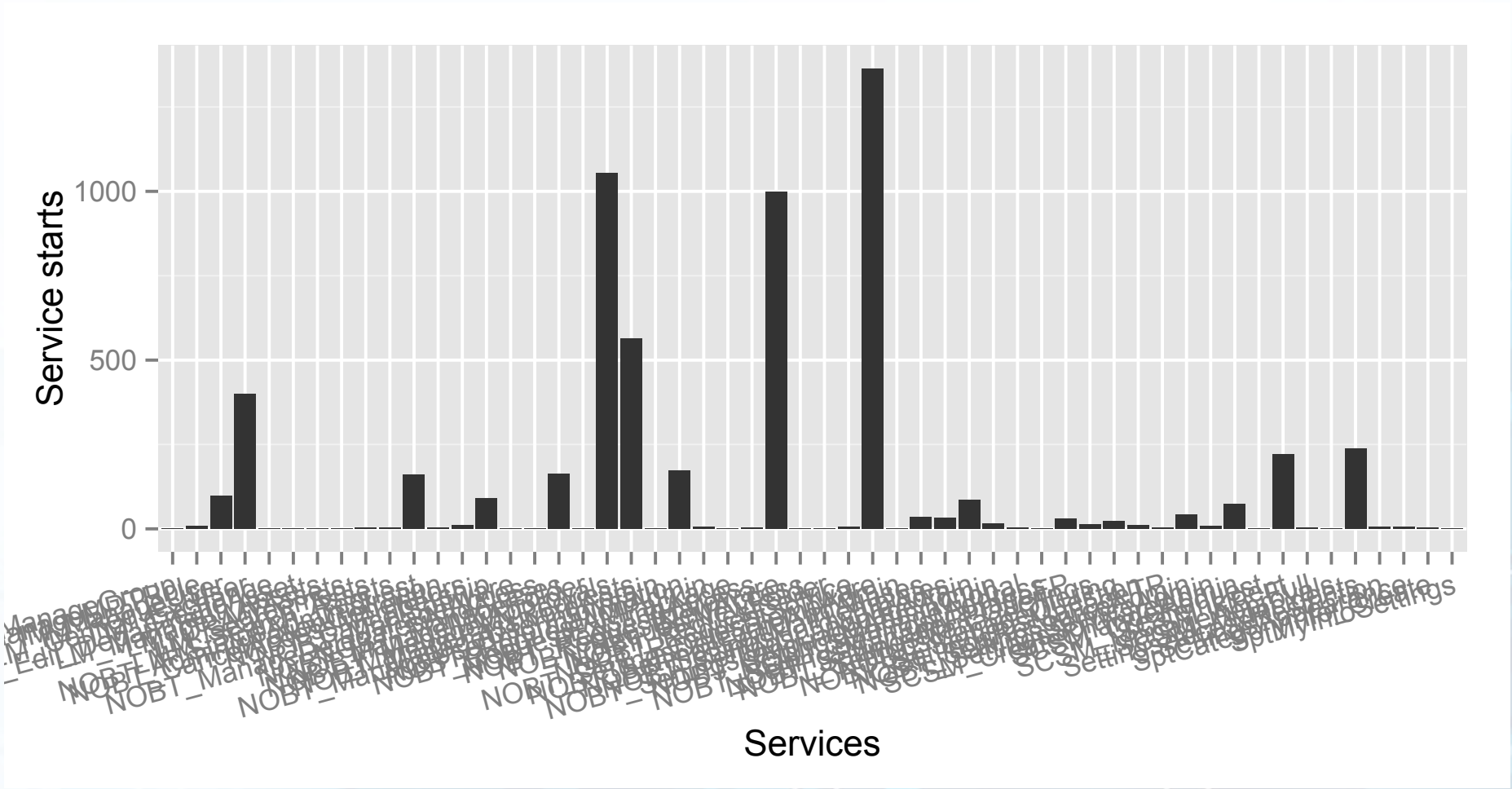
* Martini, A., Bosch, J., Chaudron, M., 2014. "*Architecture Technical Debt: Understanding Causes and a Qualitative Model*", Best Paper Award at 40th Euromicro Conference on Software Engineering and Advanced Applications.


“In god we trust,
all others must
bring data”
- W. Edwards Deming

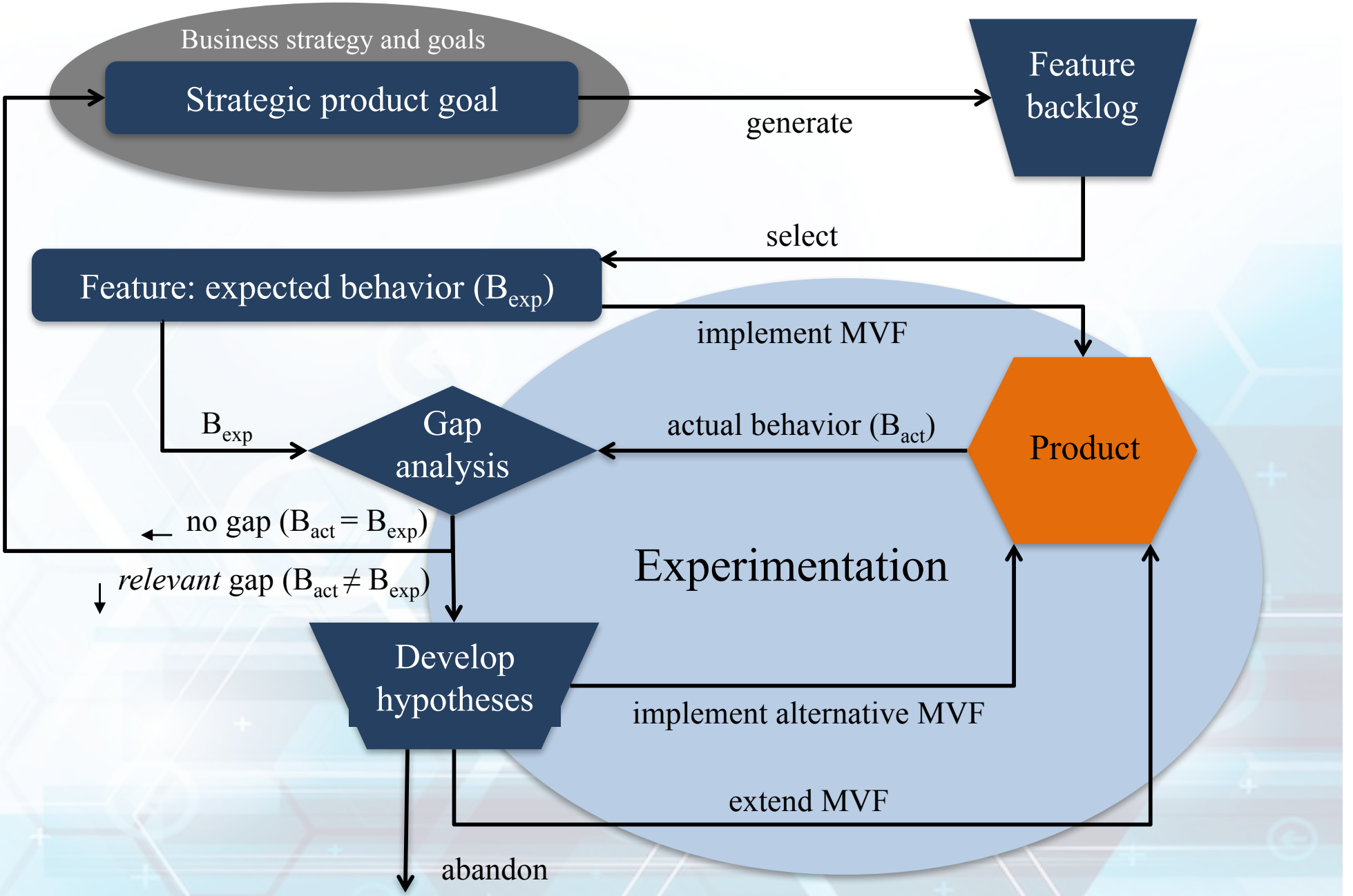
“Featuritis”


Features / Functions Used in a Typical System
Often / Always Used: 20%
Rarely / Never Used: 64%
Sometimes 16%
Rarely 19%
Often 13%
Always 7%
Never 45%
Standish Group Study Reported at XP2002 by Jim Johnson, Chairman

Our Research …



The HYPEX Model



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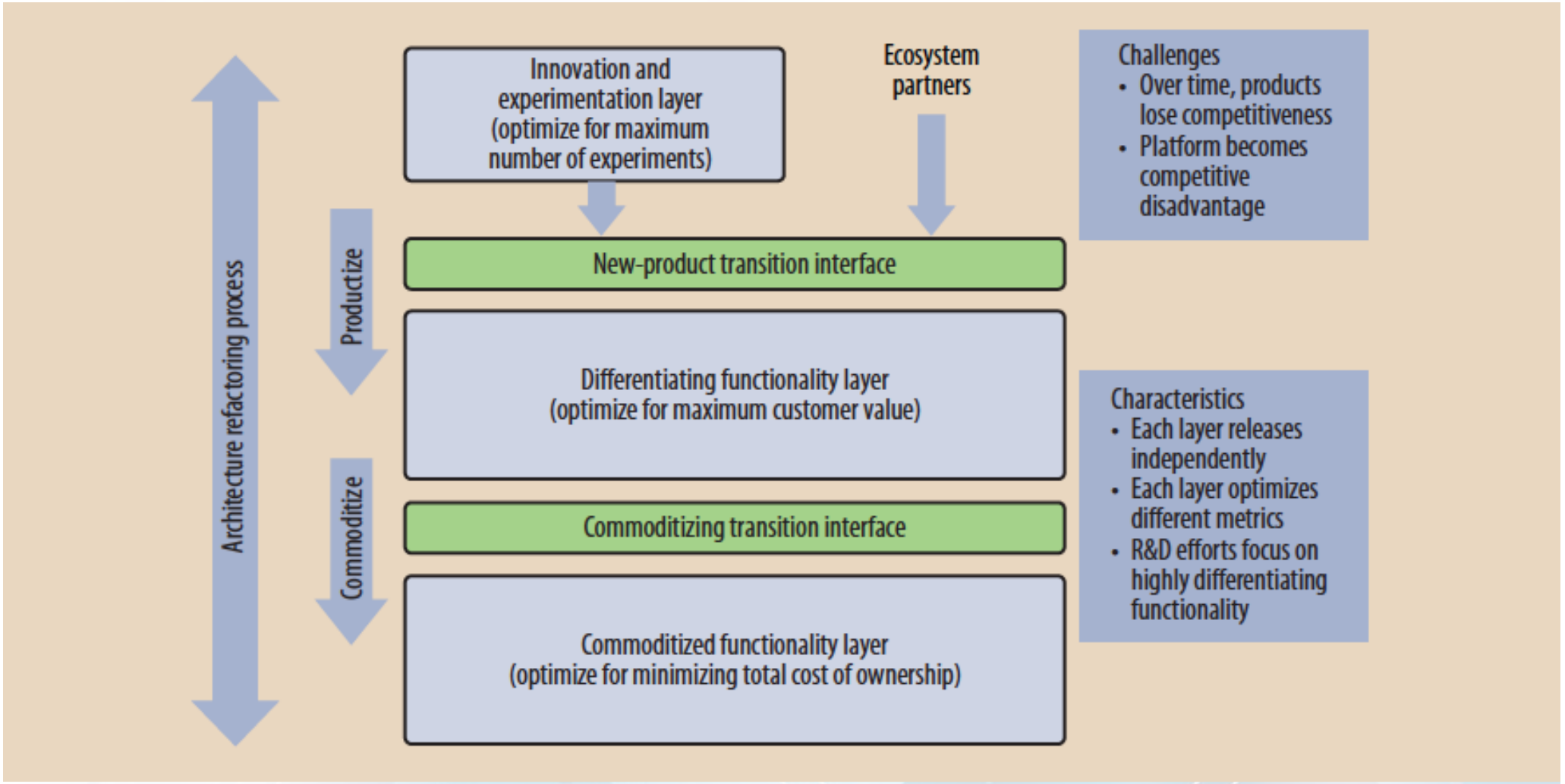
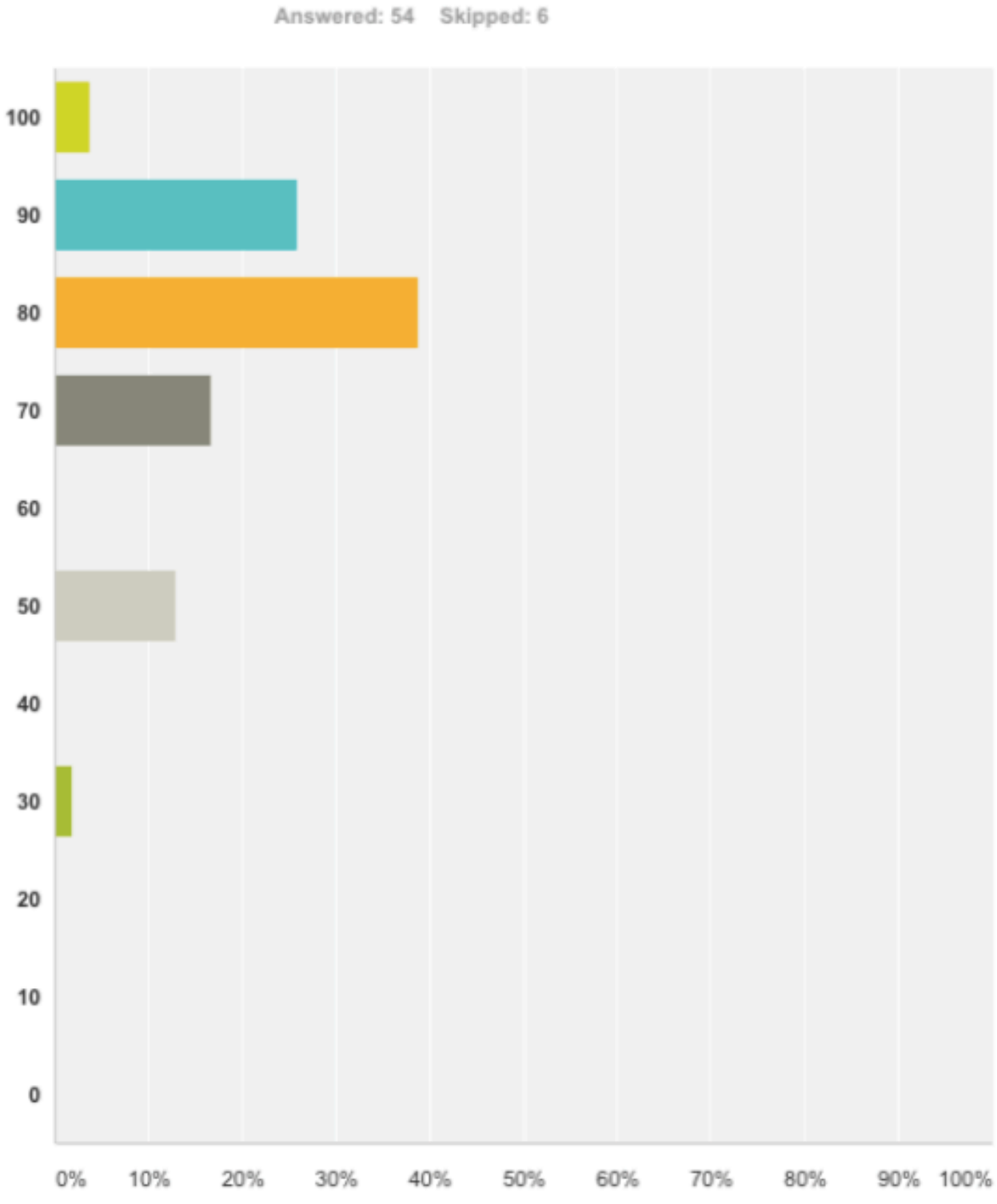
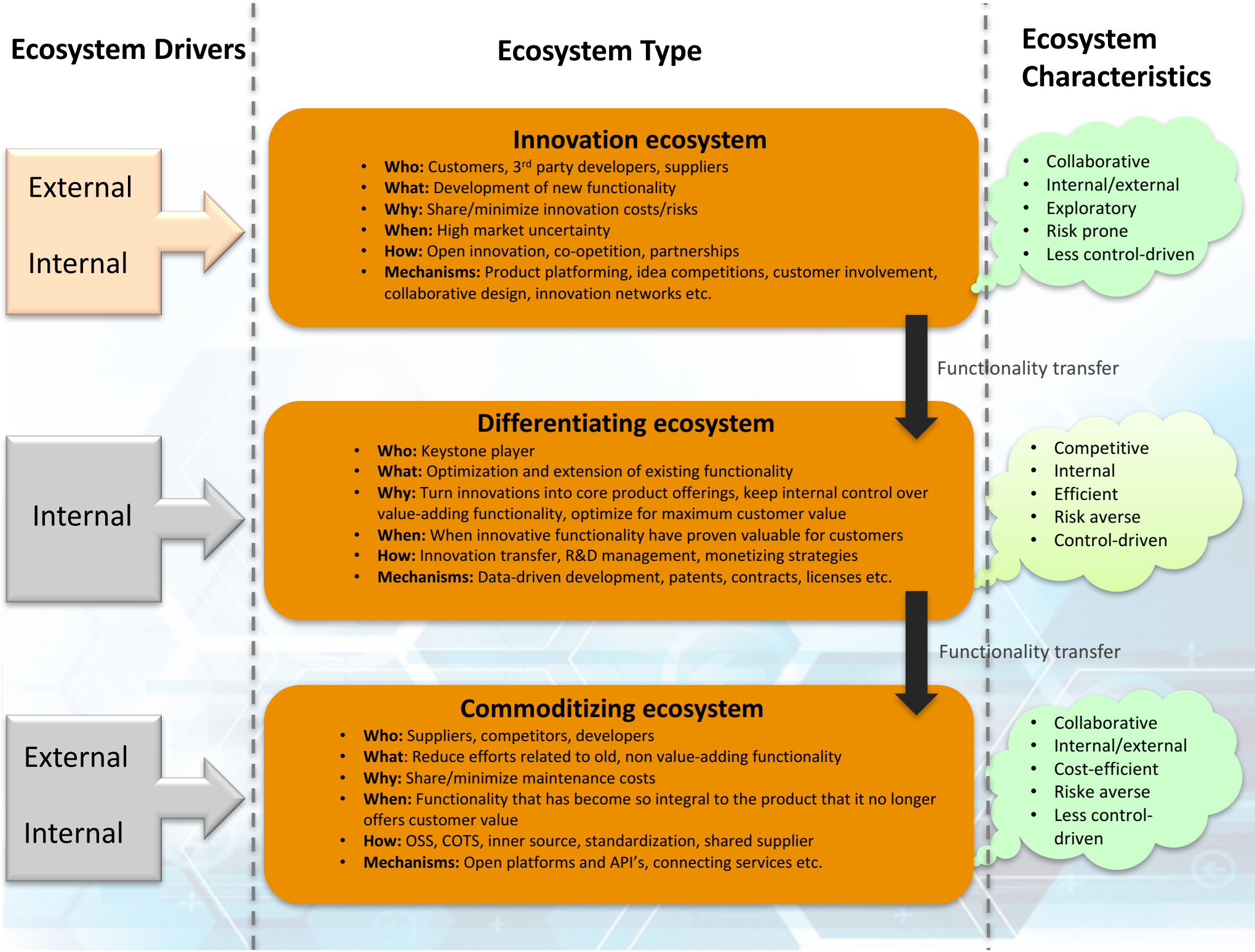


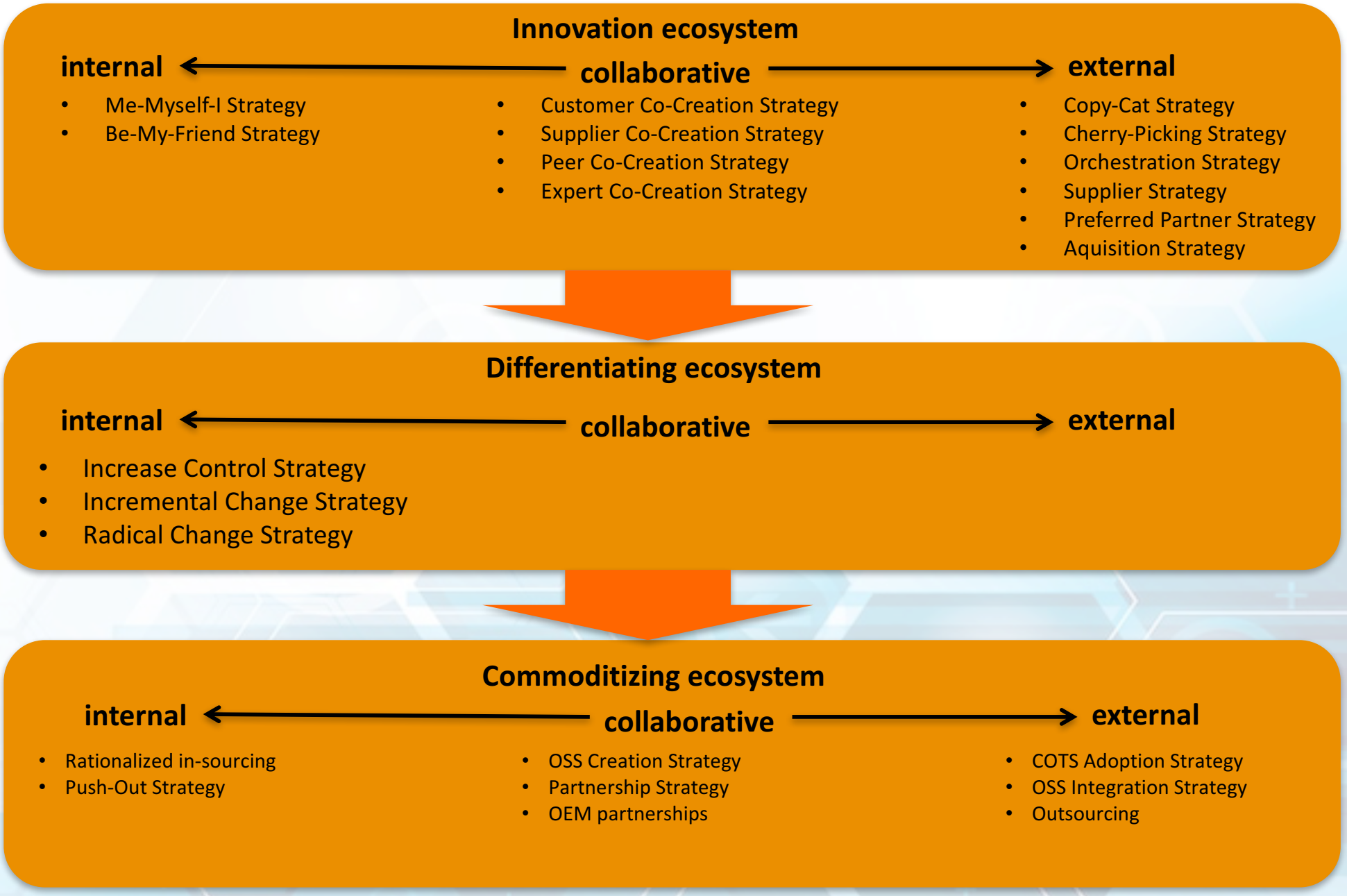
Bosch, J. (2013). Achieving Simplicity with the Three-Layer Product Model, *IEEE Computer*, Vol. 46 (11), pp. 34-39.

What % of R&D for Commodity?

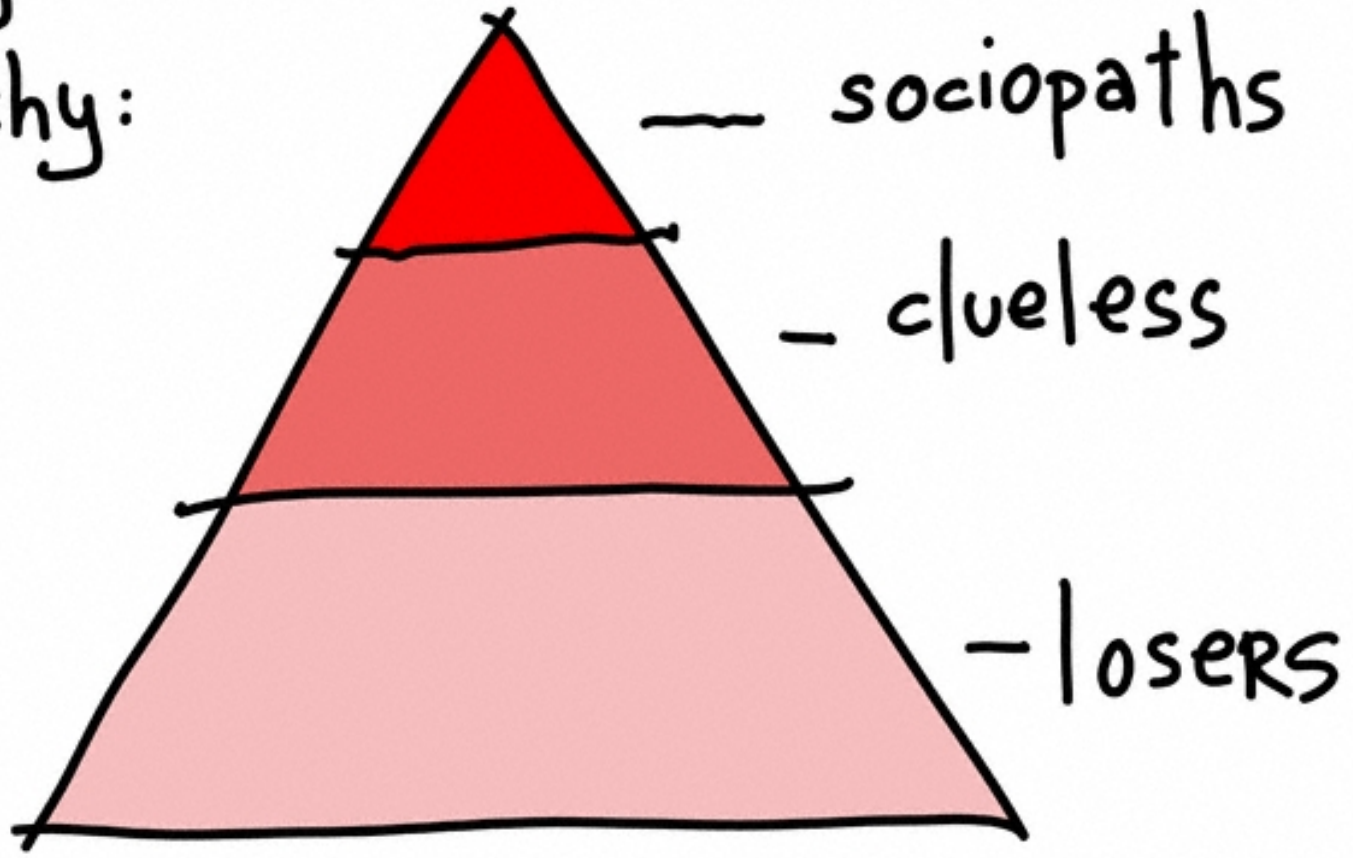



Ecosystem Drivers
Ecosystem Type
Ecosystem Characteristics
External
Internal
Innovation ecosystem
Who: Customers, 3rd party developers, suppliers
What: Development of new functionality
Why: Share/minimize innovation costs/risks
When: High market uncertainty
How: Open innovation, co-opetition, partnerships
Mechanisms: Product platforming, idea competitions, customer involvement, collaborative design, innovation networks etc.
Collaborative
Internal/external
Exploratory
Risk prone
Less control-driven
Functionality transfer
Internal
Differentiating ecosystem
Who: Keystone player
What: Optimization and extension of existing functionality
Why: Turn innovations into core product offerings, keep internal control over value-adding functionality, optimize for maximum customer value
When: When innovative functionality have proven valuable for customers
How: Innovation transfer, R&D management, monetizing strategies
Mechanisms: Data-driven development, patents, contracts, licenses etc.
Competitive
Internal
Efficient
Risk averse
Control-driven
Functionality transfer
External
Internal
Commoditizing ecosystem
Who: Suppliers, competitors, developers
What: Reduce efforts related to old, non value-adding functionality
Why: Share/minimize maintenance costs
When: Functionality that has become so integral to the product that it no longer offers customer value
How: OSS, COTS, inner source, standardization, shared supplier
Mechanisms: Open platforms and API's, connecting services etc.
Collaborative
Internal/external
Cost-efficient
Riske averse
Less control-driven

TeLESM: Three Layer Ecosystem Strategy Model



company hierarchy:



@gapingvoid

Hierarchical Organizations

Strengths

- Effective scaling
- Controlling many people from a central position
- Very efficient for repeatable tasks
- Harmonization of processes
- Globalization
- Handles low complexity situations well

Weaknesses

- Slow decision making processes
- Power driven by position; not capability
- Tendency to be internally focused
- Easily gravitates to politics
- Highly resistant to changes
- Challenged by high-complexity situations

Employee Engagement

U.S. Employee Engagement, 2013 vs. 2014

% Employees	2013	2014
Engaged	29.6	31.5
Not engaged	51.5	51.0
Actively disengaged	18.8	17.5

GALLUP

U.S. Employee Engagement, by Generation

% Employees engaged

	2013	2014
Millennials	27.5	28.9
Generation X	29.6	32.2
Baby boomers	30.9	32.7
Traditionalists	38.3	42.2

GALLUP

Sweden (2013)

Engaged	16%
Not engaged	73%
Actively disengaged	11%

Gallup uppskattar att oengagerade medarbetare kostar USA varje minst 450 miljarder dollar varje år. Tyskland går miste om minst 151 miljarder och Storbritannien 83 miljarder.

Empowerment: Principles

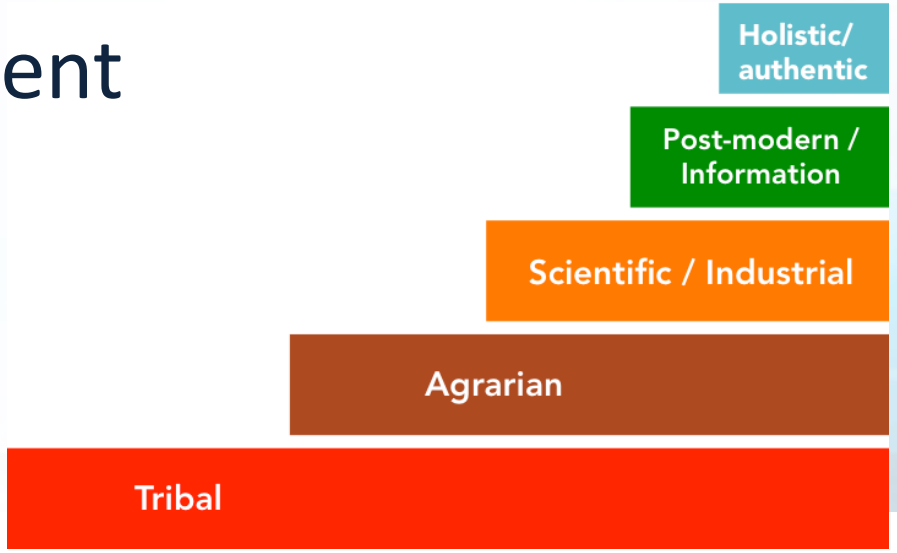
- **Self management**
  - Nobody is in command.
  - Coordination mechanisms, but no boss
  - Natural leadership leads to spontaneous, temporary hierarchies
- **Wholeness**
  - No acting to suit your boss/fit the culture
  - Be yourself at work
- **Evolutionary purpose**
  - No top-down strategy
  - Wisdom of the crowds

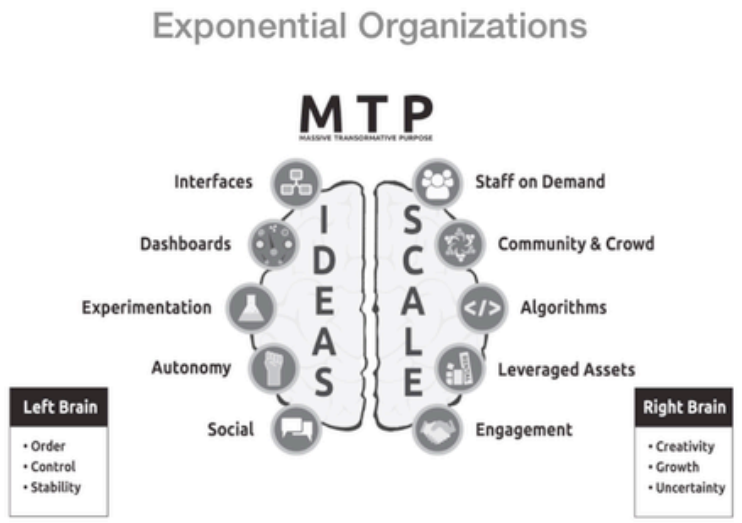
Characteristics

- **Roles**: people can shoulder one or more roles, independent on place in the organization
- **Activities**: coordinate the work of one or more roles
- **Advice process**: everyone has complete autonomy to make decisions pertain to their role or roles. Stakeholders need to be asked for advice though. *Note: this is NOT consensus!*
- **Agreements**: People can negotiate agreements to coordinate work, agree on SLAs and other relevant factors. Agreements are entered voluntarily.
- **Evolution**: Roles, activities and agreements evolve constantly in mutual agreement

Examples

- Agile software development
- Holistic organizations
- Holacracy
- Exponential organizations





Empowerment

- **Principles** over *Orders*
- **Personal leadership** over *Leader – Follower*
- **Trust** over *Audits*
- **Customer first** over *Organization structure first*
- **Team appointed managers** over *Manager appointed teams*
- **Diversity** over *Homogeneity*
- **Agility** over *Long-term planning*
- **Emergent strategy** over *Top-down strategy*

Overview

- Vem är jag? Wie ben ik? Who am I?
- Trends in Industry: Need for Speed
- Towards a New Business Operating System
  - Speed
  - Data
  - Ecosystems
  - Empowerment
- Conclusion

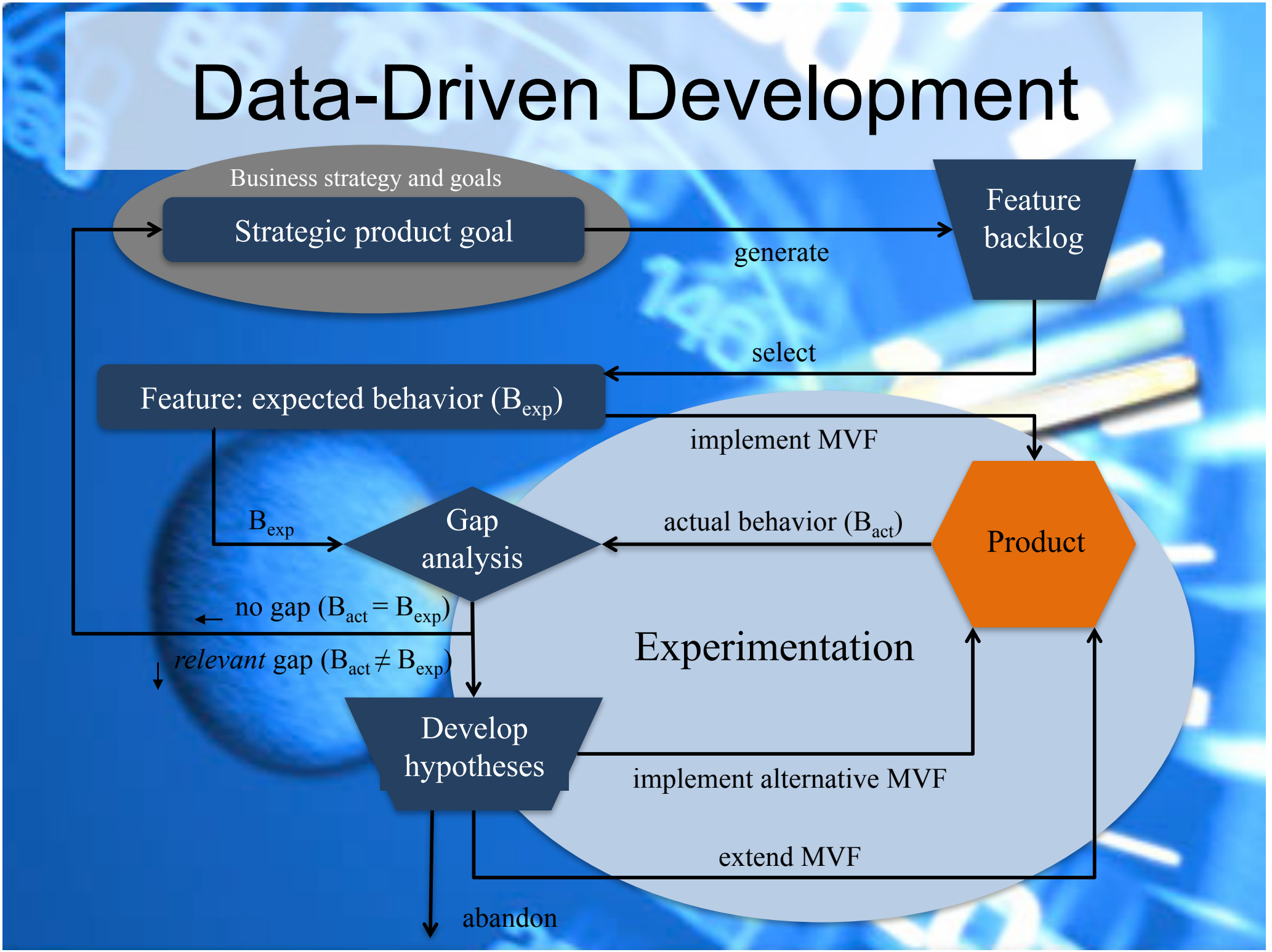

“In the future, all companies will be software companies”
George F. Colony (CEO Forrester Research)

Speed

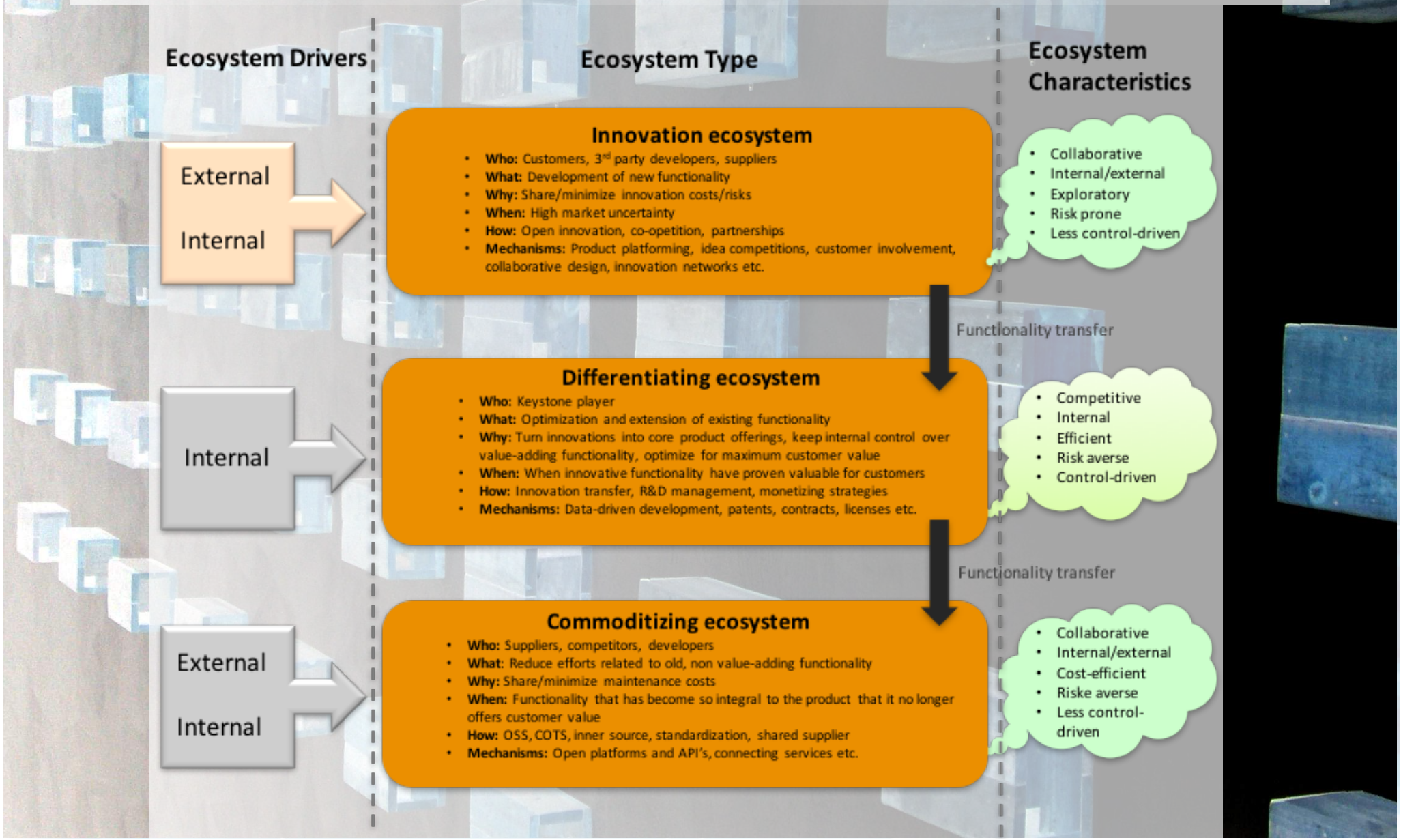
- Increasing **SPEED** trumps ANY other improvement R&D can provide to the company – the goal is **continuous deployment** of new functionality

- If you're not a front-line engineer, there is only ONE measure that justifies your existence: how have you helped teams move faster?
- Don't optimize efficiency, optimize speed

Data-Driven Development



Software Ecosystems



Empowered Organizations

- We are moving towards a new business operating mechanism focused on **empowerment** and **autonomy**

- Teams and individuals employ local decision making, peer-to-peer alignment, choose their own leaders and innovate and improve constantly

Not My Job?!

Strong LEADERSHIP needed from YOU

Information Technology

"This book gives you a great set of tools on how to bring business architecture and technology architecture together to drive a common set of goals and objectives."
– Brendan Bank, CTO Booking.com

"A must read for any leader or professional in the software industry. Simple, but insightful, Stairway models provide compelling and practical guidance for both every-day challenges and extensive transformations in the realm of software development."
– Mladen Pilipovic, Director of Engineering, Spotify

"SDE offers a fascinating and well-researched overview of the major trends in the software industry. If you want to survive as a software company in the 21st century, add this wonderful book to your reading list."
– Jurgen Appelo, author of Management 3.0 and Managing for Happiness

"Jan Bosch is a pioneer in how he systematically demonstrates the strength of changing the perspective for working with software. He shows how new services, products and value is created by drawing on the deep knowledge software developers have of customers, coupled with tools such as software architecture knowledge and ways of working, user feedback and data collection."
– Ingrid Nordmark (CEO Swedish Institute for Computer Science)

This book unifies those three of the most current best practices of the software-driven industry: speed, data, and ecosystems. Speed in value creation through software, namely continuous integration, continuous delivery, and continuous experimentation. Data to feedback what we did is actually the most effective and efficient to create value. Ecosystems to supersede classical business models by factors. The book explains the relationships, gives examples, and guides you with frameworks so that the application in your next project will let you harvest all the smartness and profitability that is possible in today's software development."
– Michael Kircher, CTO DATEV eG, Germany

"The excellent book of Speed, Data and Ecosystems by Jan Bosch captures the essence for any industry and company that is in the process of transforming into a digital future. Jan Bosch builds his knowledge based on academic research and experience from the industry combining this into a holistic approach how to work with software leveraging from the opportunities and meeting the challenges.
– Mats Melander, Director Automation Solutions at Tetra Pak

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