

**RIETI Open BBL Webinar:
RIETI-METI Joint Project "New Horizons of Economic Security" Series
Handout**

**An Overview of Economic Security (5):
From an Industrial Policy Perspective**

December 20, 2023

Gill Pratt

<https://www.rieti.go.jp/jp/index.html>

Thoughts about Organization From DARPA to TOYOTA

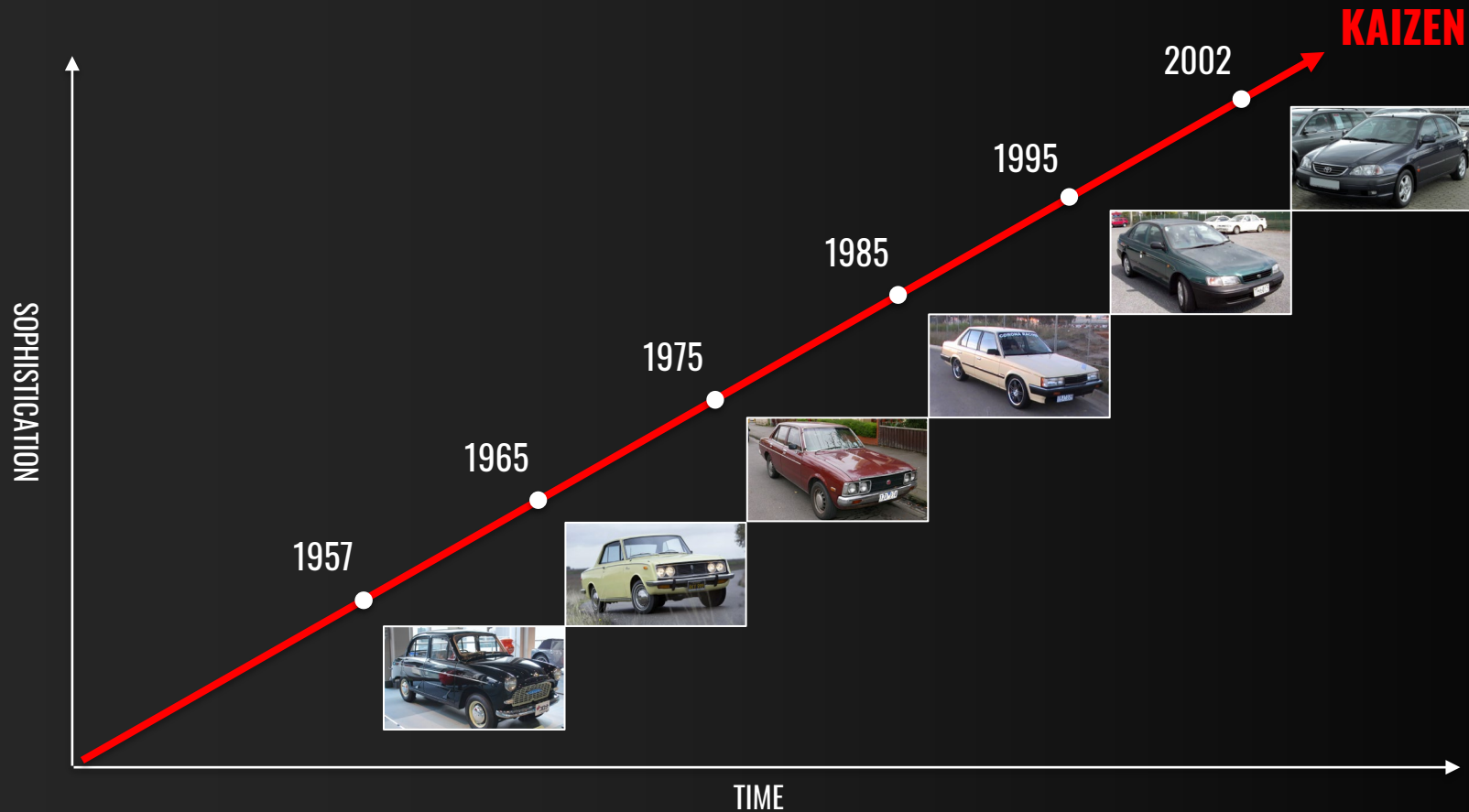
GILL PRATT

(slides from 2016 – 7 years ago!)



TOYOTA
RESEARCH INSTITUTE

45 YEARS OF TOYOTA CORONA (1957 – 2002)



EXPONENTIAL GROWTH IN SOPHISTICATION

EVOLUTION OF THE MOBILE PHONE



MOTOROLA
8900X-2

NOKIA
2146

NOKIA
3210

NOKIA
6210

ERICCSON
T39

ALCATEL
OT511

SAMSUNG
E250

APPLE
IPHONE

BLACKBERRY
CURVE 8900

SAMSUNG
GALAXY S2

SAMSUNG
GALAXY S4

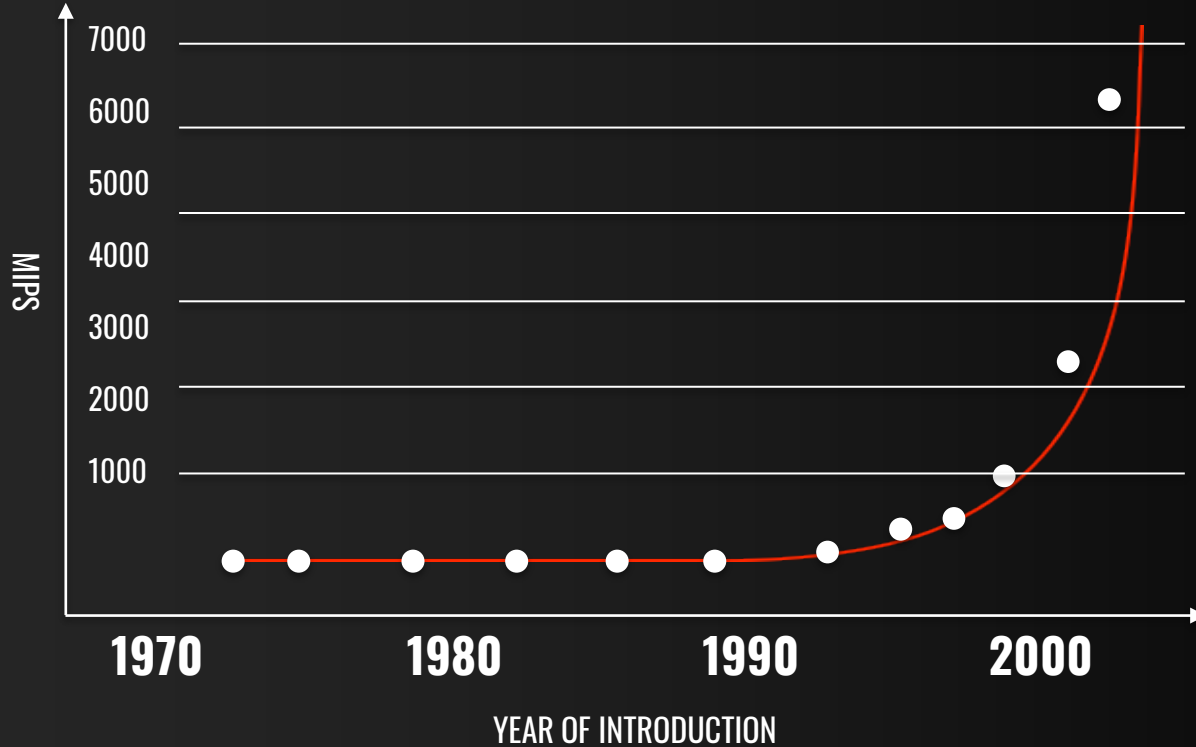
SONY XPERIA
Z ULTRA

9 YEARS

30 YEARS

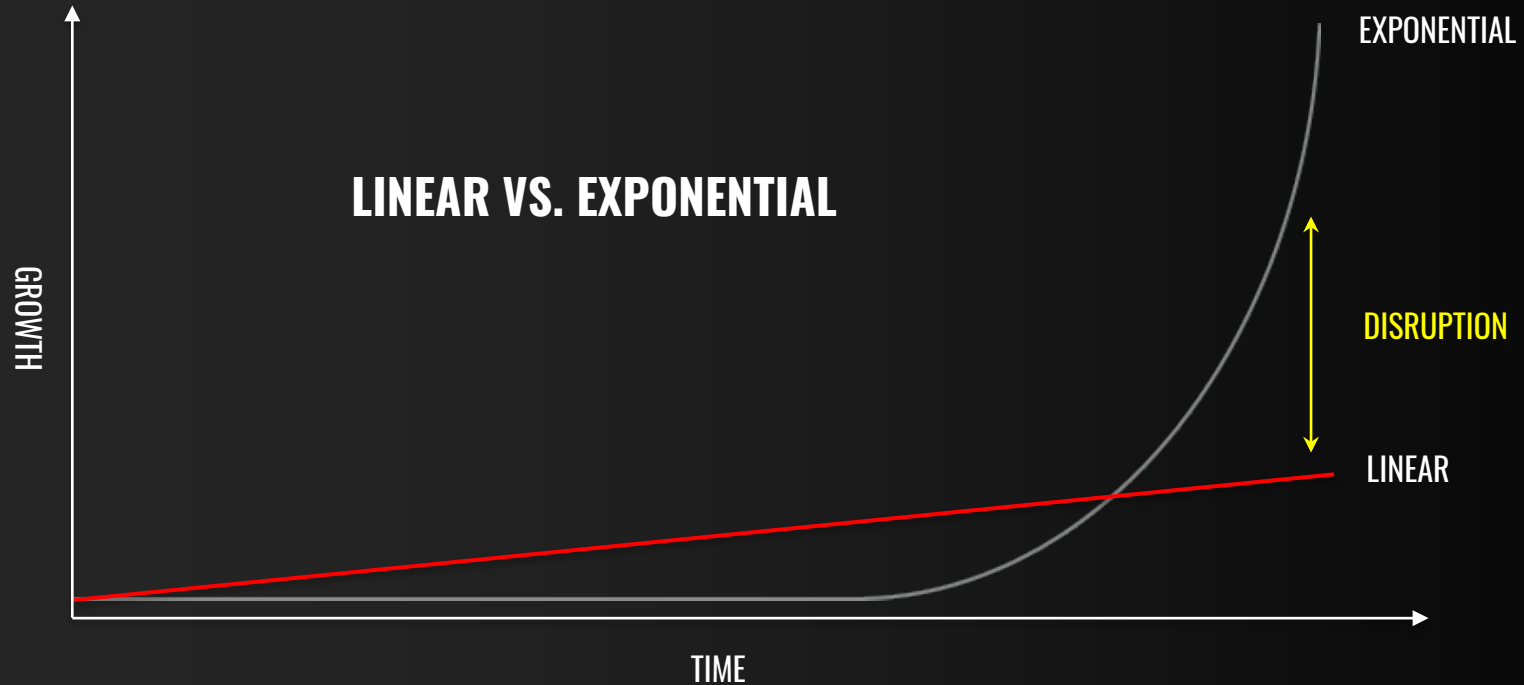
45 YEARS OF COMPUTER PROGRESS – EXPONENTIAL GROWTH

INTEL PROCESSORS APPROXIMATE COMPUTING POWER



**CAN LINEAR PROGRESS (KAIZEN)
COMPETE IN THE LONG TERM
WITH EXPONENTIAL GROWTH?**

ANSWER: NO



**WE NEED TO FIND
ANOTHER WAY**

DARPA / ARPA History

1957

Surprise: First orbiting satellite by the USSR



Sputnik

DARPA / ARPA History

1958

Response: Dwight Eisenhower, President of the United States creates DARPA



Sputnik

Dwight D. Eisenhower

DARPA's First Program

1958

DARPA: F1 engine



1967

Saturn V



Global Positioning System

1963

DARPA Transit 2A satellite pioneered doppler navigation for specific defense missions.



1990's

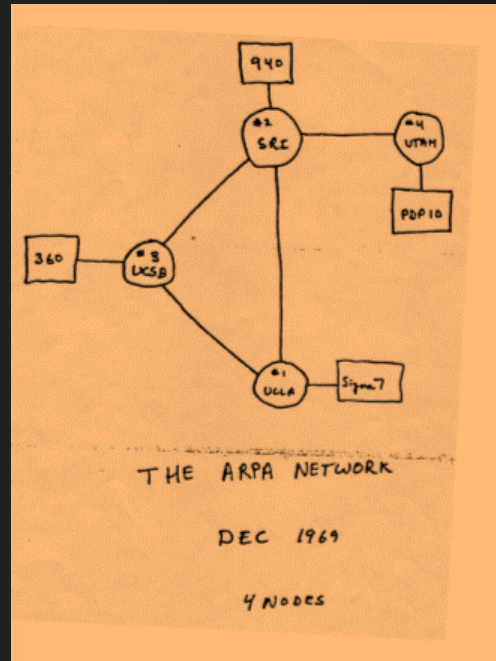
Became global precision navigation technology for military and *civilian* use.



ARPAnet -> Internet

1969

Original ARPAnet for remotely sharing large volumes of data.



Are These the Equivalent of Sputnik?



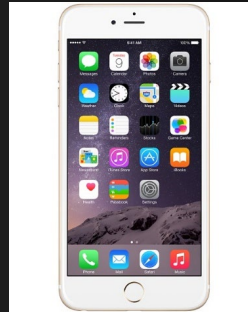
Google



Mobileye



Uber



Apple (Hypothetical Car Design)

Probably Yes, for several reasons

1. Young people are now more in love with their cell phones than their cars

- Extension of persona -> Utilitarian means of transportation

2. Aging Society

- Older people drive less and have less income with which to buy cars.
- There will be fewer driving-age people with disposable income.

3. Transportation Service Economy (e.g. Uber, ZipCar)

- Fewer parked cars -> many more miles/yr./car -> fewer new cars sold / mile traveled
- No brand loyalty, company tendency to purchase base models + play manufacturers off against each other

4. Mature industry

- For most cars, brands are very similar
- Fierce competition, low profits, easily changed market share

5. Many competitors

- Even as #1 revenue company, Toyota only has 12% of market
- Google has > 85% of search market

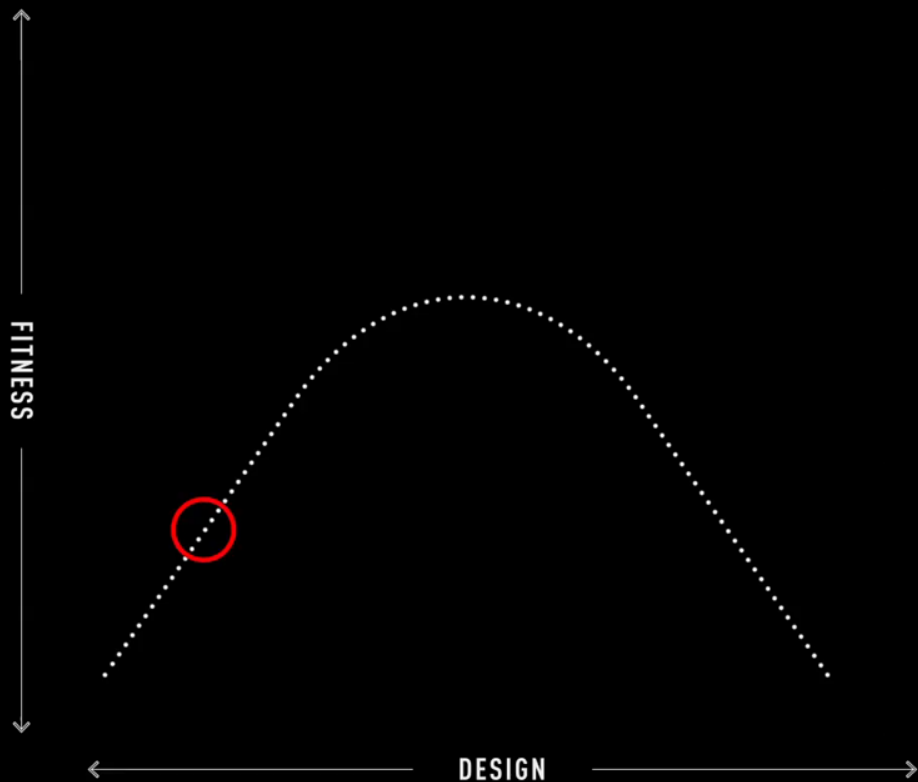
6. New IT companies have significant advantages

- Technology : Computer Vision, Machine Learning, Big Data Analytics
- Infrastructure : Data Collection & Storage, Computing, Communications infrastructure
- People : Extraordinary talent in software
- Glamor : Working for Google, Apple >> Working for Auto Company

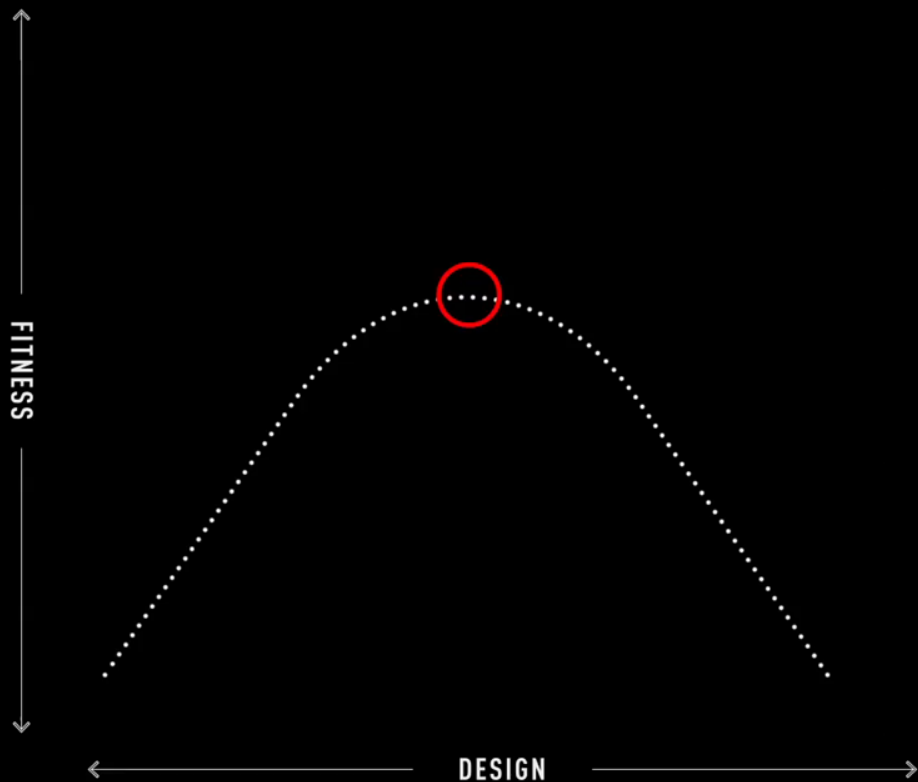
KAIZEN STATIC ENVIRONMENT



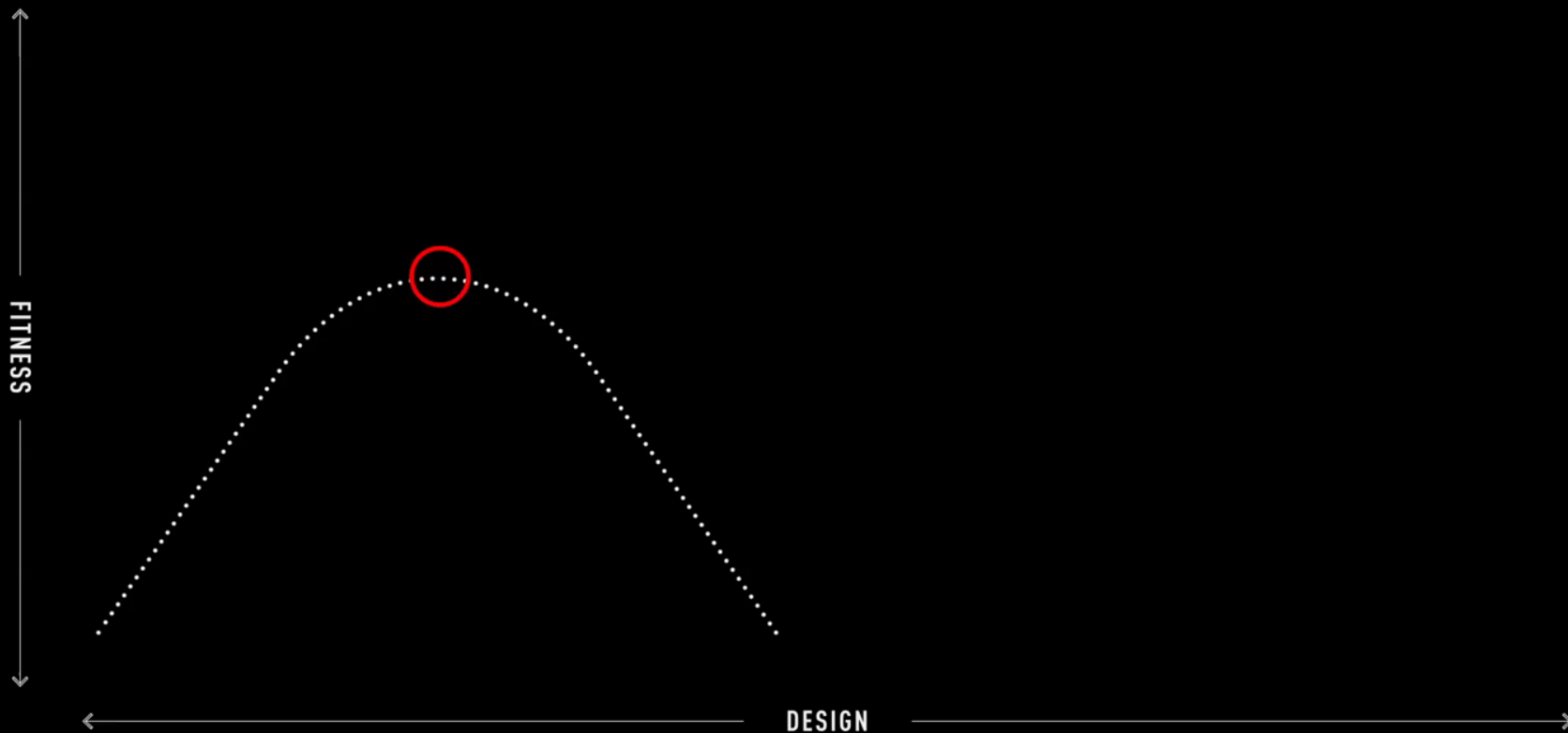
KAIZEN STATIC ENVIRONMENT



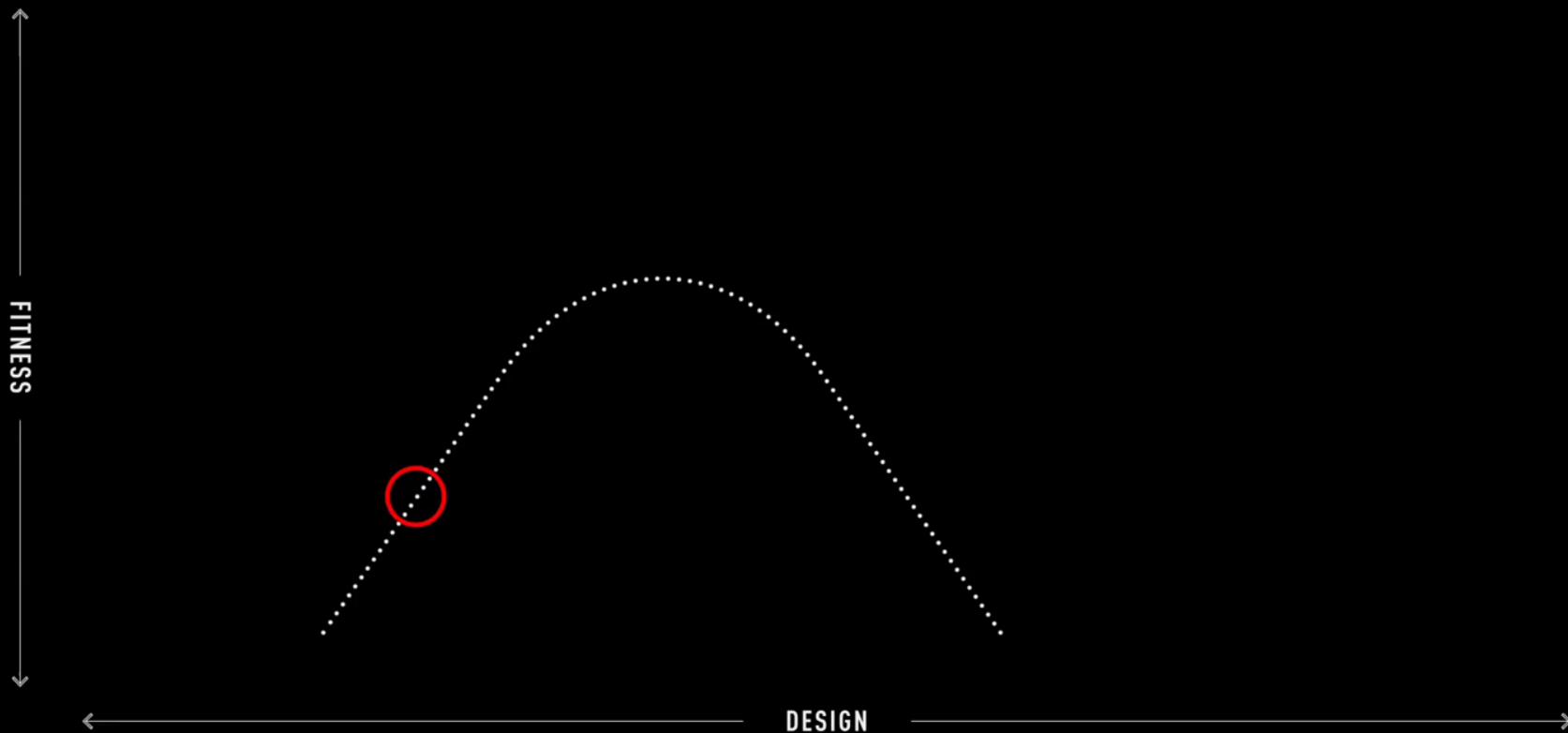
KAIZEN SLOWLY CHANGING ENVIRONMENT



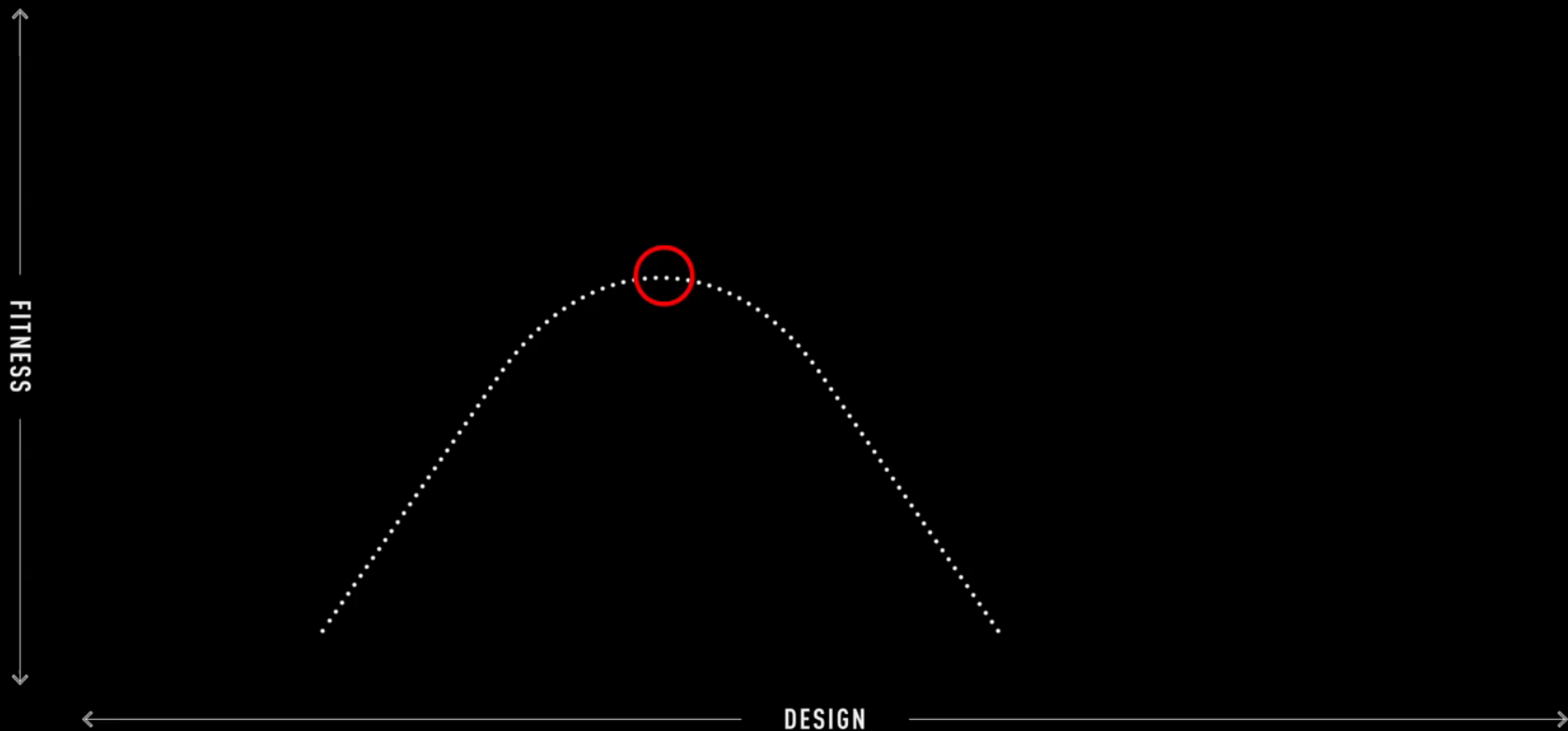
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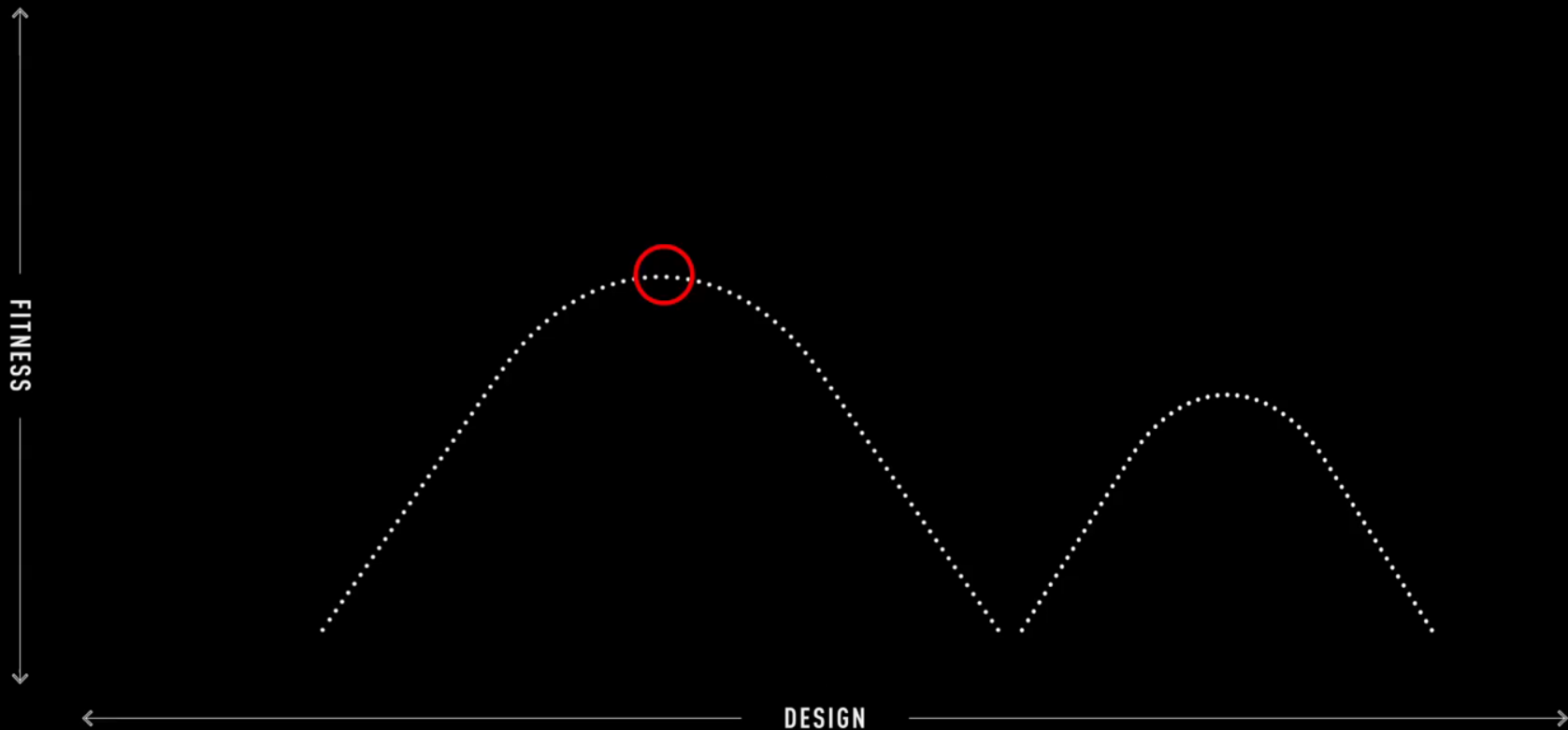
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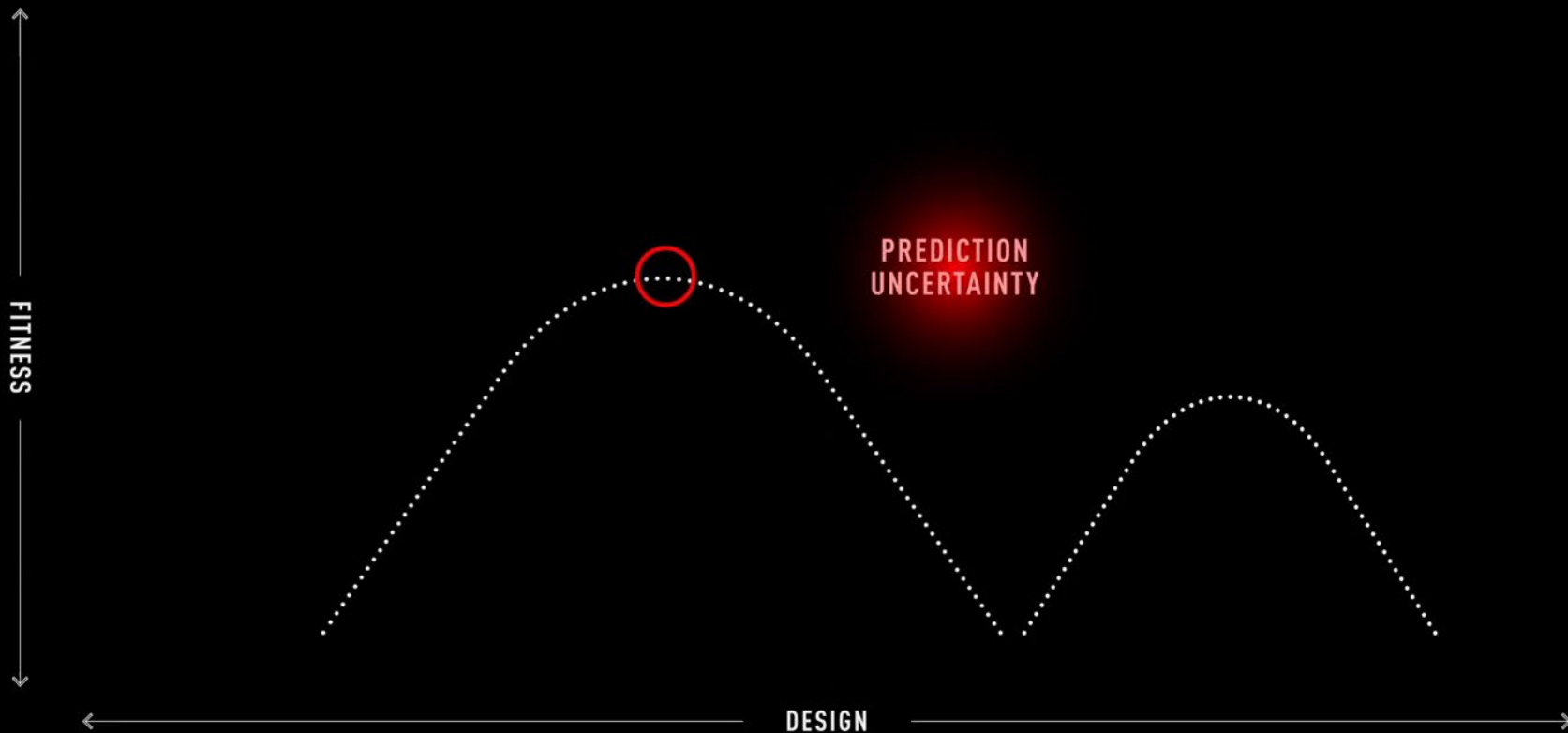
PARADIGM SHIFT OR NEW MARKET



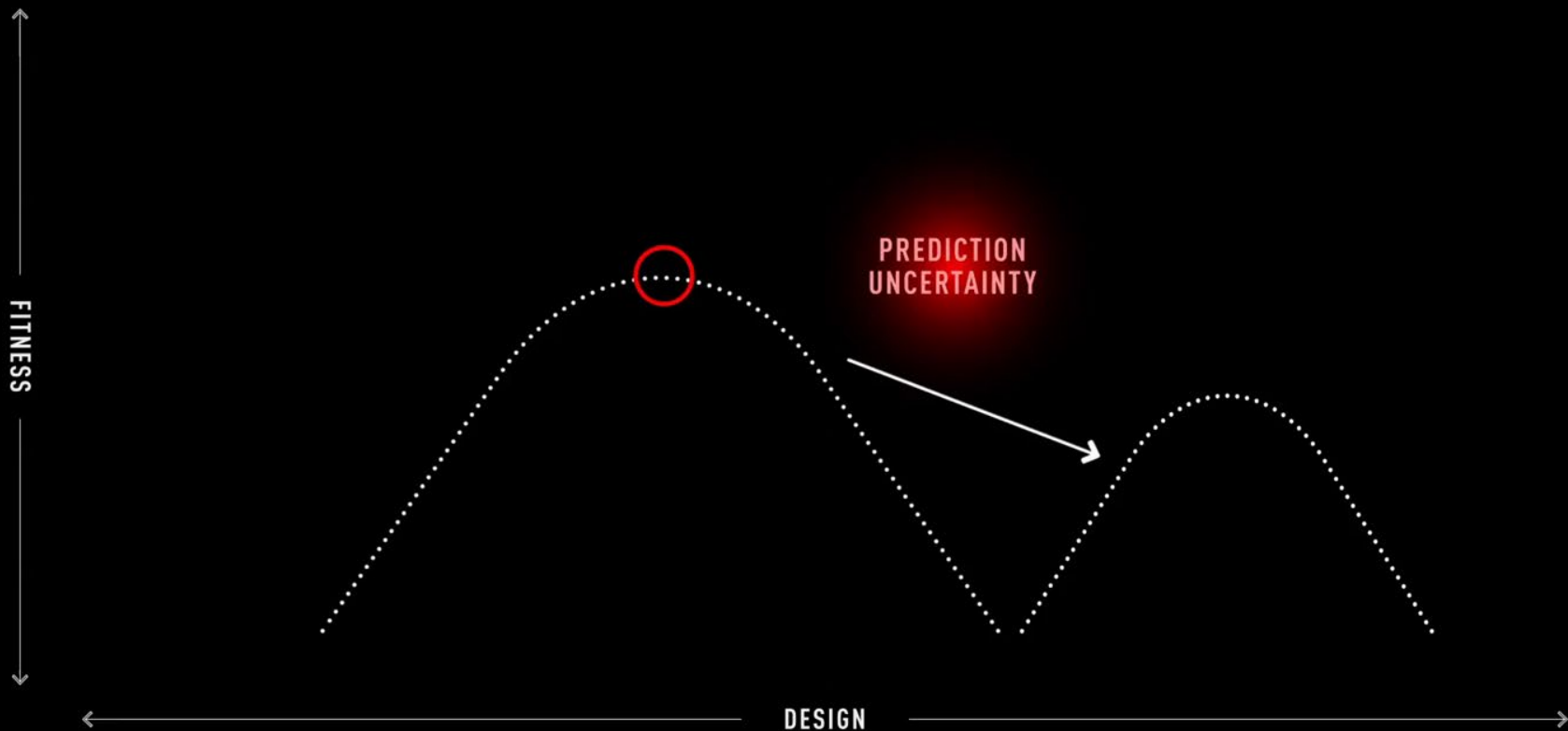
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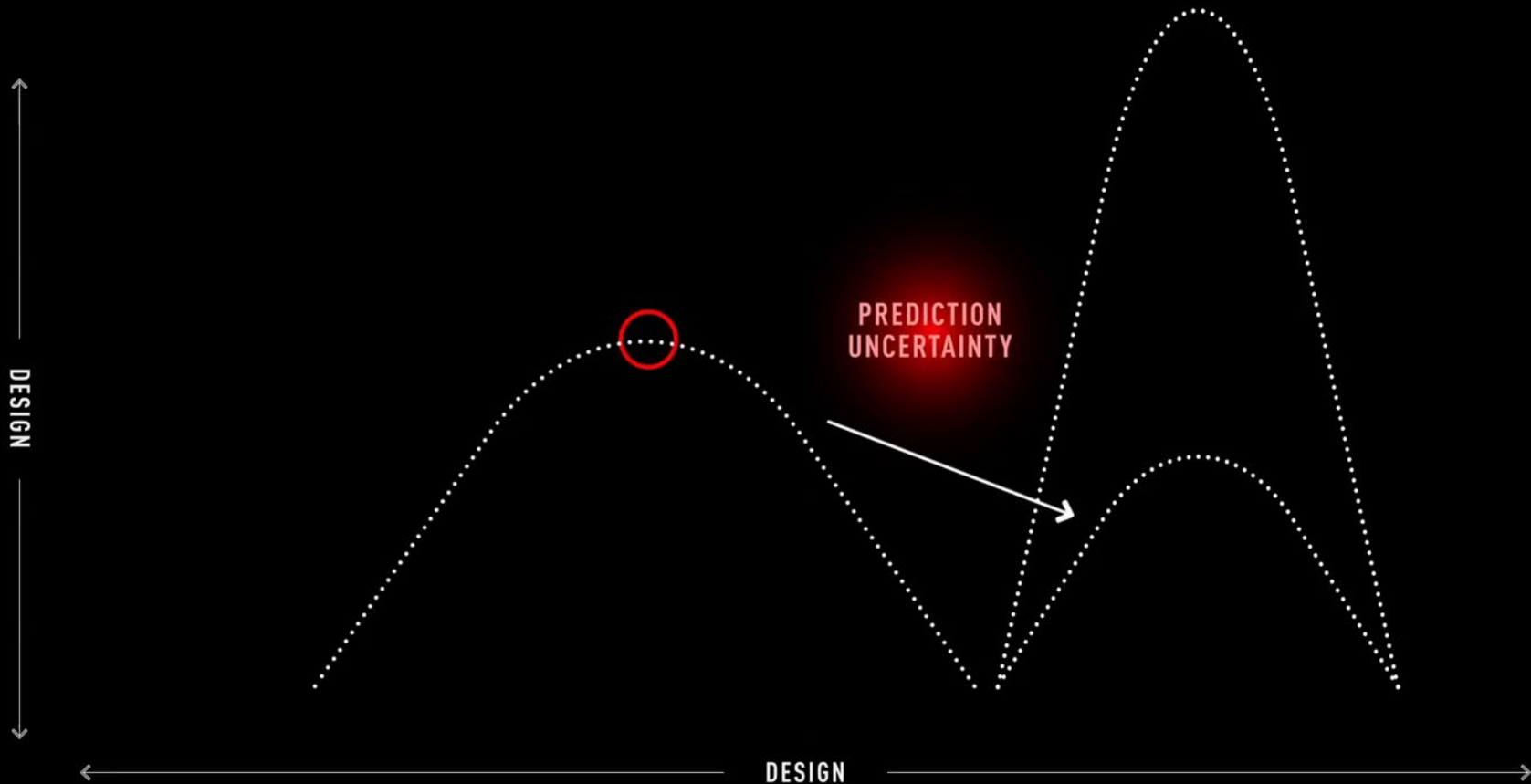
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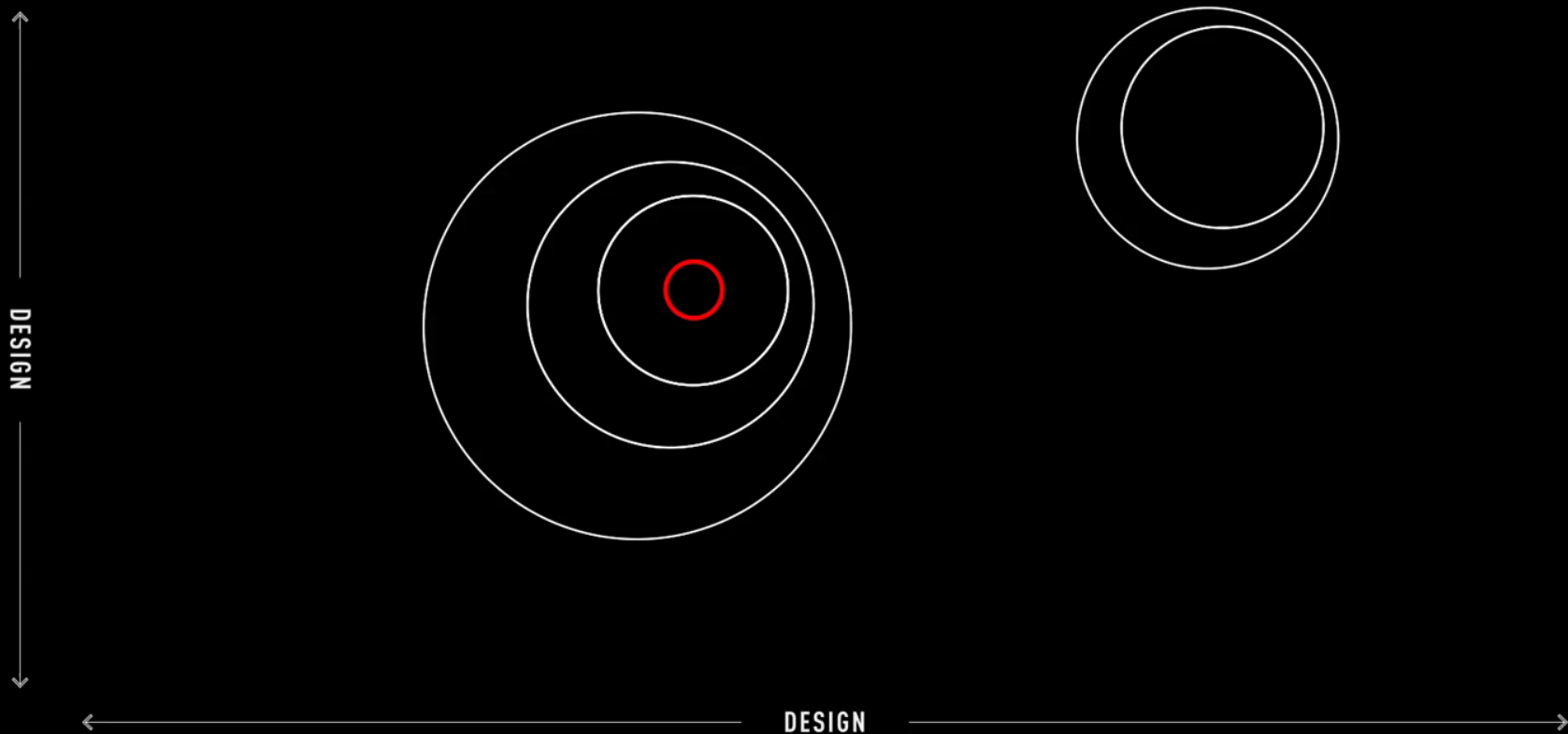
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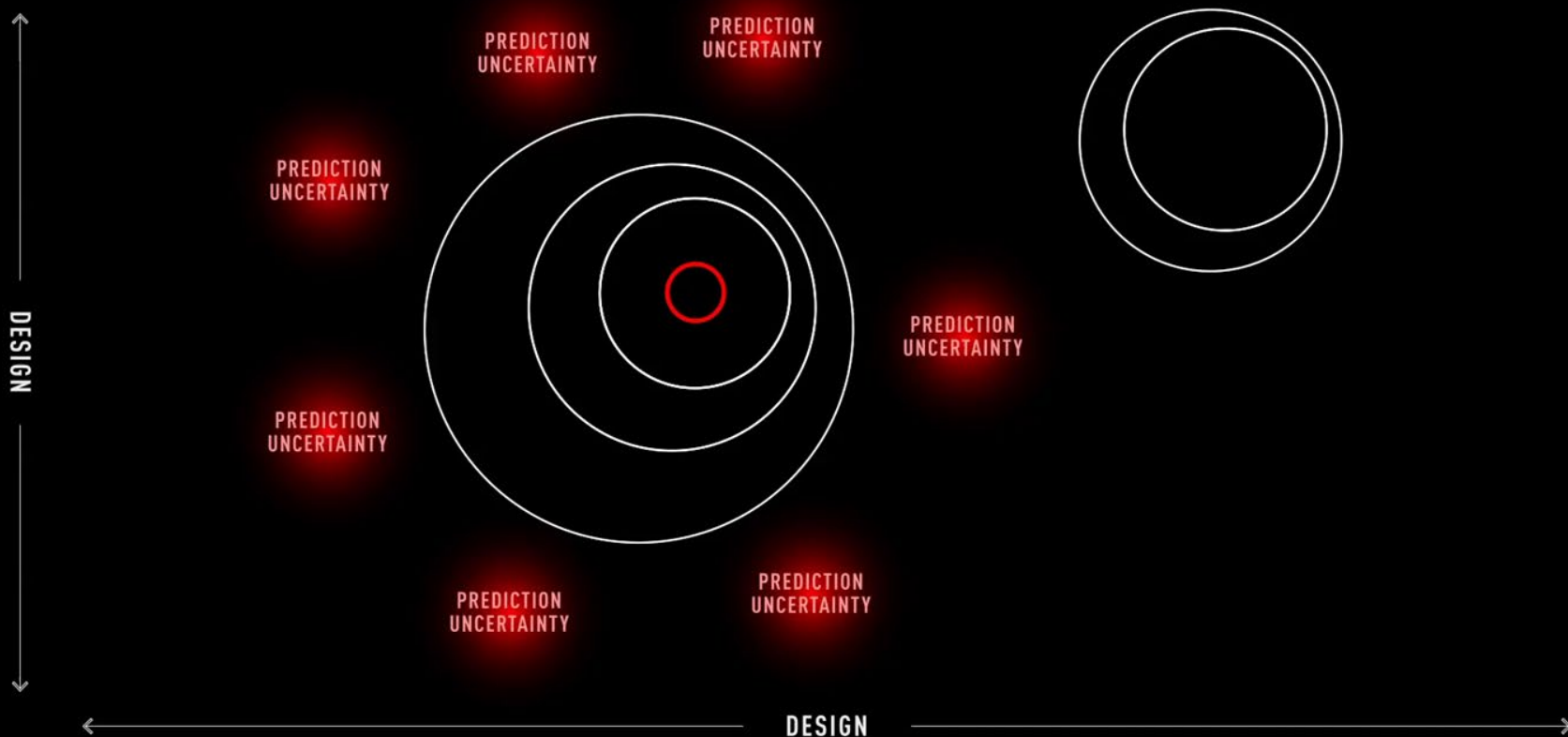
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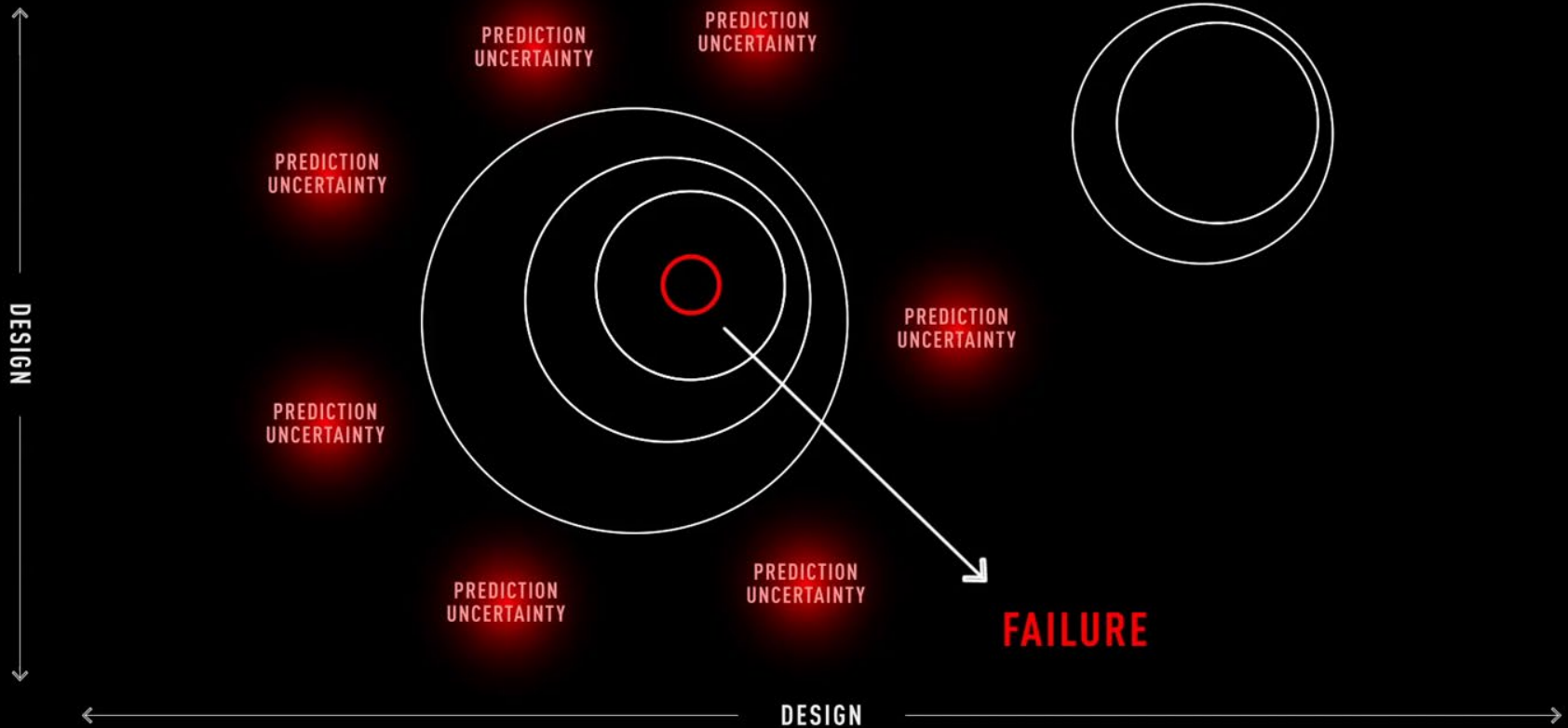
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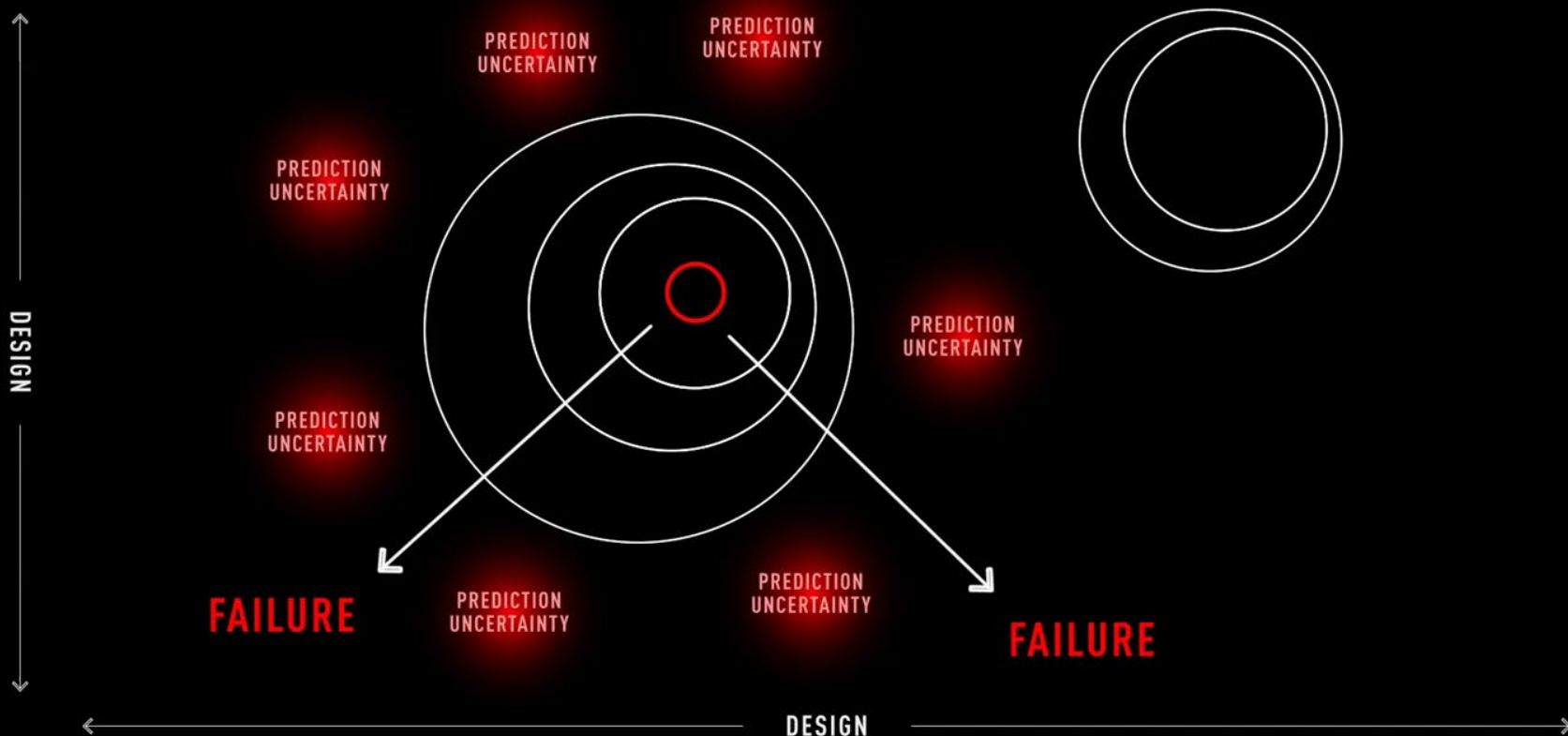
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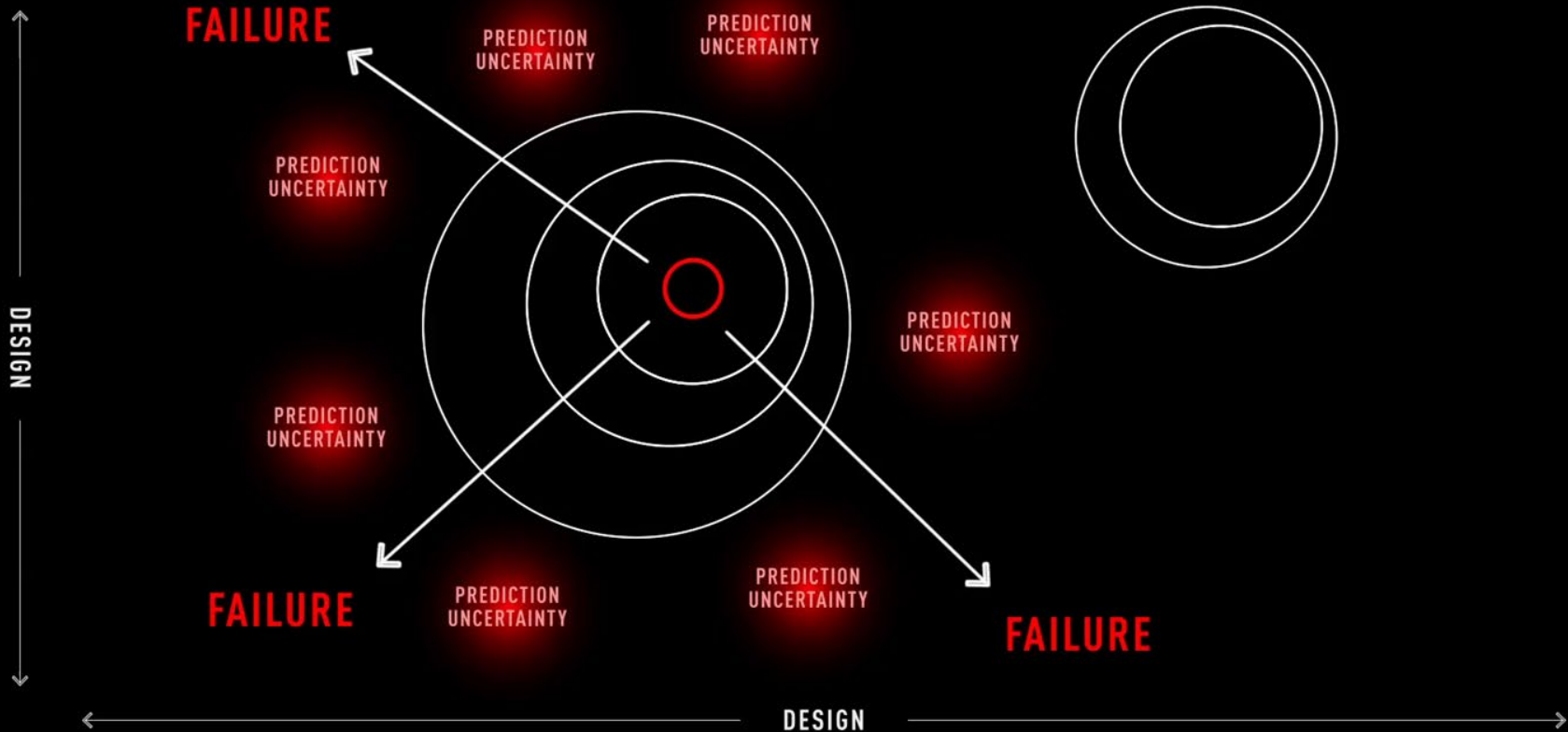
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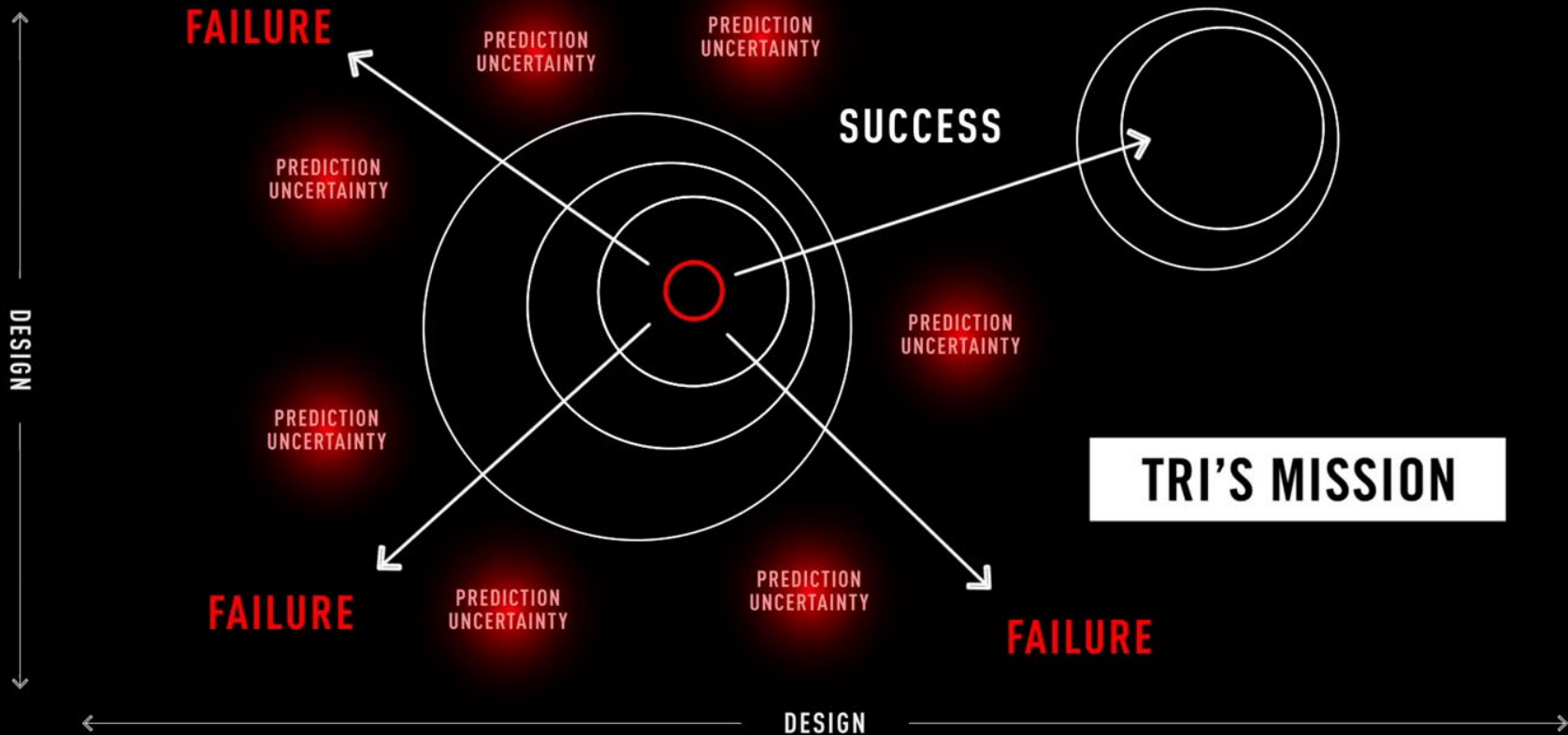
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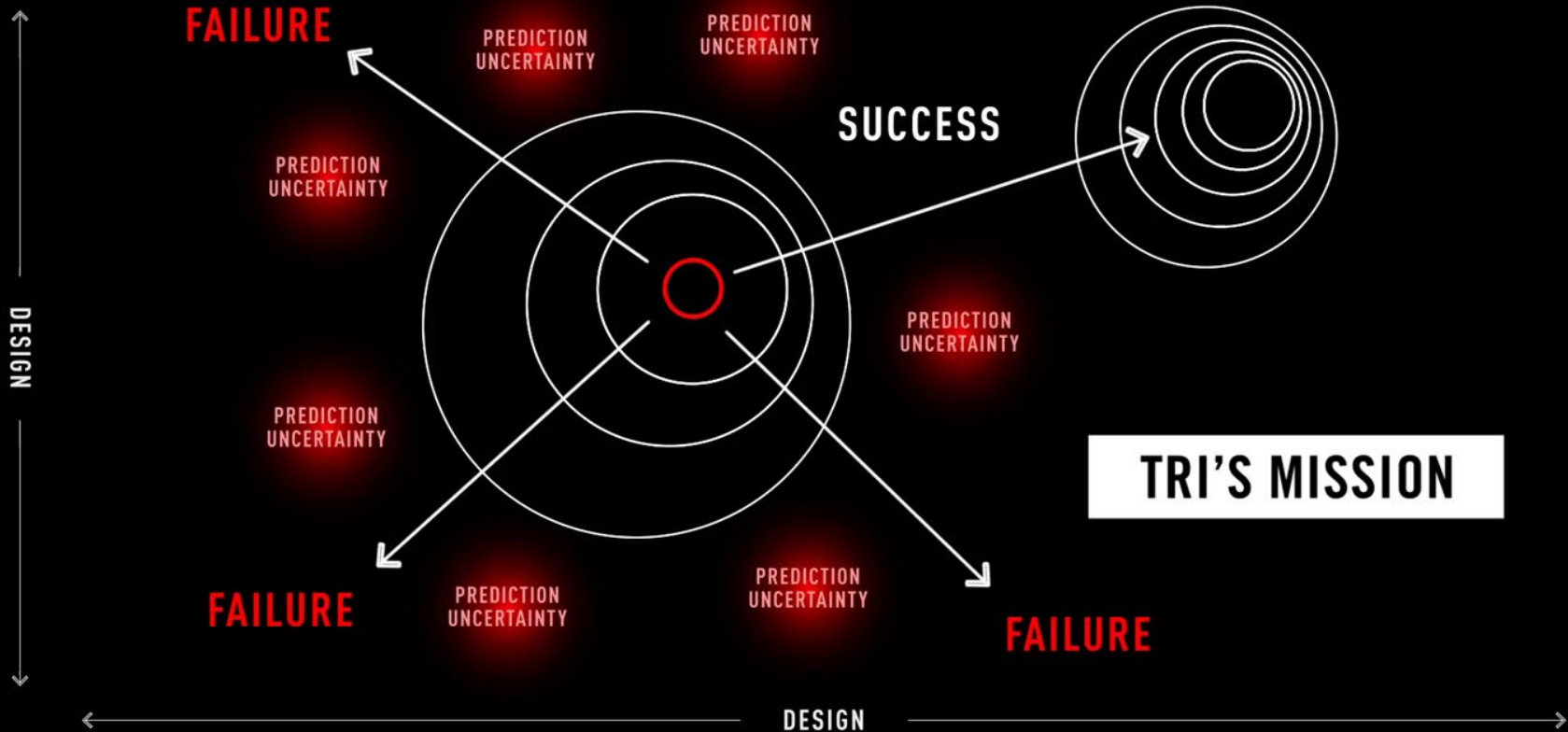
PARADIGM SHIFT OR NEW MARKET



PARADIGM SHIFT OR NEW MARKET



KAIZEN PROCESS RENEWED



R&D Management Lessons from DARPA

- Select High Risk, High Reward Projects
- Don't Duplicate Other People's Work
- Realize that a significant fraction of high risk projects will fail
- Some failure is good – as long as you learn from it
 - If you aren't failing, your goals are too easy and the results will have too low reward
- Focus on a few, well funded projects vs. many smaller projects
- Establish clear quantitative metrics to measure progress against objectives
- Give program managers significant resources, autonomy and trust
 - Average DARPA PM: \$30M / yr.
 - My Programs: \$60M / yr.
- Establish a culture where reporting honestly is more valued than reporting good news
- Be highly selective in choosing program managers
 - It is a great honor to be chosen to work for DARPA
- Rotate program managers every 2-5 years, borrowing them from Industry and Academia
 - DARPA Alumni are very highly valued

What Should Toyota Do? (Answers from 7 years ago)

1. **Become #1 in Intelligent Vehicles**

- Establish a robust “Guardian” program to make Toyotas accident proof as soon as possible, eliminating the possibility of competitors with better autonomy taking market share from Toyota. Demonstrate clear intelligent vehicle market leadership by 2020 Olympics.

2. Leverage Toyota’s User focused design + extraordinary Manufacturing strengths + Intelligence + User Interface technology to **diversify into new markets**

- First example: Mobility of goods and people indoors (a.k.a. Home Robotics)
 - Great promise given aging society, but will be broadly applicable
 - People will form close bonds with home robots that are fading with automobiles

3. Realize the economic value of data collected by cars + robots, and **become a more vertical company**, similar to Apple (Hardware + Software + Data)

4. Exploit the intelligent vehicle project to increase innovation and attractiveness for the most talented to work for Toyota. **Why shouldn’t Toyota be as glamorous to work for as Google ?**

Attraction, Retention, Nurturing of the Best People

- **Go to where the talent is:**
 - Silicon Valley, Michigan, Boston, Tokyo
- **Establish intimate relationships with universities**
 - Stanford, Michigan, MIT, University of Tokyo
- **Rotate the best staff**
- **Compensation + benefits similar to Google, Apple, etc ...**
- **Emphasize social good**
 - Saving lives, giving the elderly mobility, independence, quality of life
- **Emphasize culture of making things**
 - We don't just sell advertisements
- **Open Innovation**
 - Establish a consortium for open sharing of external safety-related and traffic technology, unlikely to be lasting competitive differentiator
- **Strict Secrecy** on proprietary internal man/machine experience likely to be a lasting competitive differentiator
- **Establish challenge competitions** with very high goals
- **Tap into excitement of incredible demonstration for 2020 Olympics**
- **Trust but verify** : Significant autonomy from HQ + Tough, Quantitative Metrics to measure performance

Organization + Management: Establish a “Skunk Works”

Lockheed “Skunk Works”



Kelly Johnson



TOYOTA
RESEARCH INSTITUTE

Thank You!