

MANAGEMENT OF TECHNOLOGY



TECHNOLOGY

TECHNOLOGY

Technology

is a system of professional knowledge (SW)

and instruments (HW)

for exploiting nature's potentials

to satisfy the needs of the society.

Today's economic landscape is being shaped
by two powerful forces:
technology and **globalization**.

Philip Kotler

TECHNOLOGY

TECHNOLOGY

system of expertise and tools

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system of expertise and tools



TECHNOLOGY

system of expertise and tools





- 1897 Dr. Felix Hofman: acetylsalyicylic acid
- 1899 market entry of Bayer Aspirin
- 1971 Dr. John Vane: mechanism of action for aspirin-like drugs
- 1982 Dr. John Vane: Nobel Prize in Physiology or Medicine
- 1984 Sir John Vane: gained the title of knight



audio physic



TECHNOLOGY TYPOLOGIES

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TECHNOLOGY TYPOLOGIES

PRODUCT TECHNOLOGY:

WHAT?

TECHNOLOGY TYPOLOGIES

PRODUCT TECHNOLOGY:

Product concept, product design,
application engineering,
after sale service etc.

WHAT?

PROCESS TECHNOLOGY:

HOW?

TECHNOLOGY TYPOLOGIES

PRODUCT TECHNOLOGY:

WHAT?

Product concept, product design,
application engineering,
after sale service etc.

PROCESS TECHNOLOGY:

HOW?

Manufacturing or service procedures,
quality management, logistics,
maintenance of the machinery etc.

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CORE TECHNOLOGY

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CORE TECHNOLOGY

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CORE TECHNOLOGY

Necessary for the basic function

TECHNOLOGY TYPOLOGIES

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Necessary for the basic function
of the product.

COMPLEMENTARY TECHNOLOGY

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Necessary for additional functions
of the product in most cases.

PERIPHERAL TECHNOLOGY

TECHNOLOGY TYPOLOGIES

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PERIPHERAL TECHNOLOGY

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BASE TECHNOLOGY

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BASE TECHNOLOGY

Commonly known and used.

KEY (DIFFERENTIATION) TECHNOLOGY

TECHNOLOGY TYPOLOGIES

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Commonly known and used.

KEY (DIFFERENTIATION) TECHNOLOGY

Mastered by a single firm
or a limited number of firms.

PACING TECHNOLOGY

TECHNOLOGY TYPOLOGIES

BASE TECHNOLOGY

Commonly known and used.

KEY (DIFFERENTIATION) TECHNOLOGY

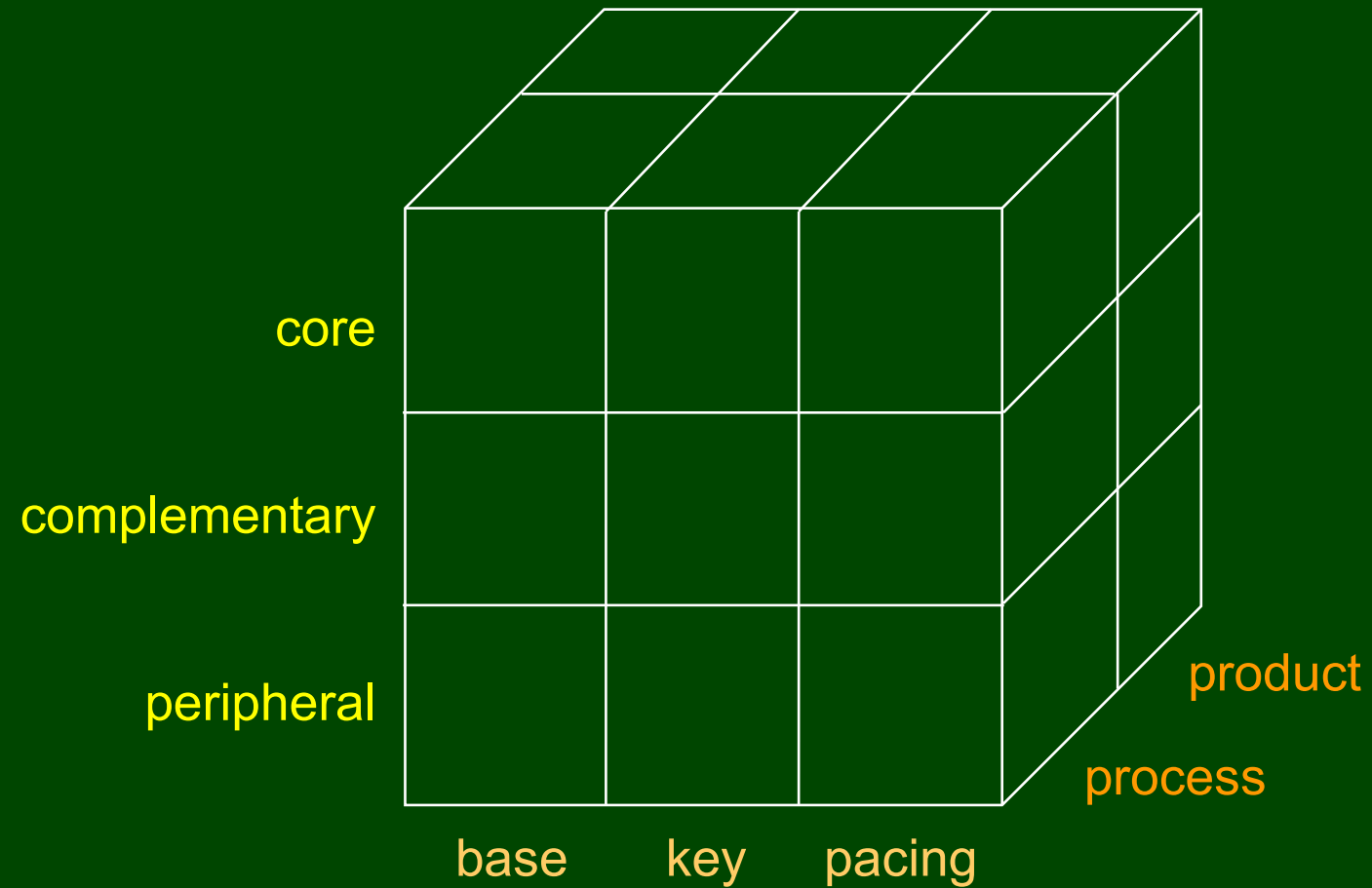
Mastered by a single firm
or a limited number of firms.

PACING TECHNOLOGY

Under development, not used yet.

TECHNOLOGY TYPES

TECHNOLOGY TYPES



MANAGEMENT

MANAGEMENT

PLANNING

ORGANIZING

CONTROLLING

LEADING

MANAGEMENT

PLANNING

ORGANIZING

CONTROLLING

LEADING

human

physical

financial

informational

resources

MANAGEMENT

PLANNING

ORGANIZING

CONTROLLING

LEADING

human

physical

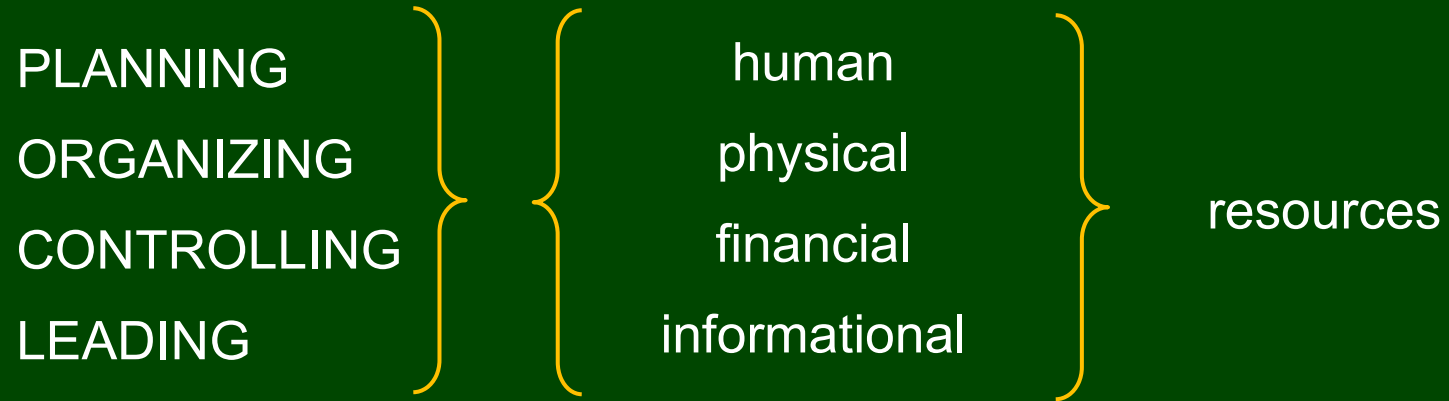
financial

informational

resources

for setting proper goals

MANAGEMENT



for setting proper goals

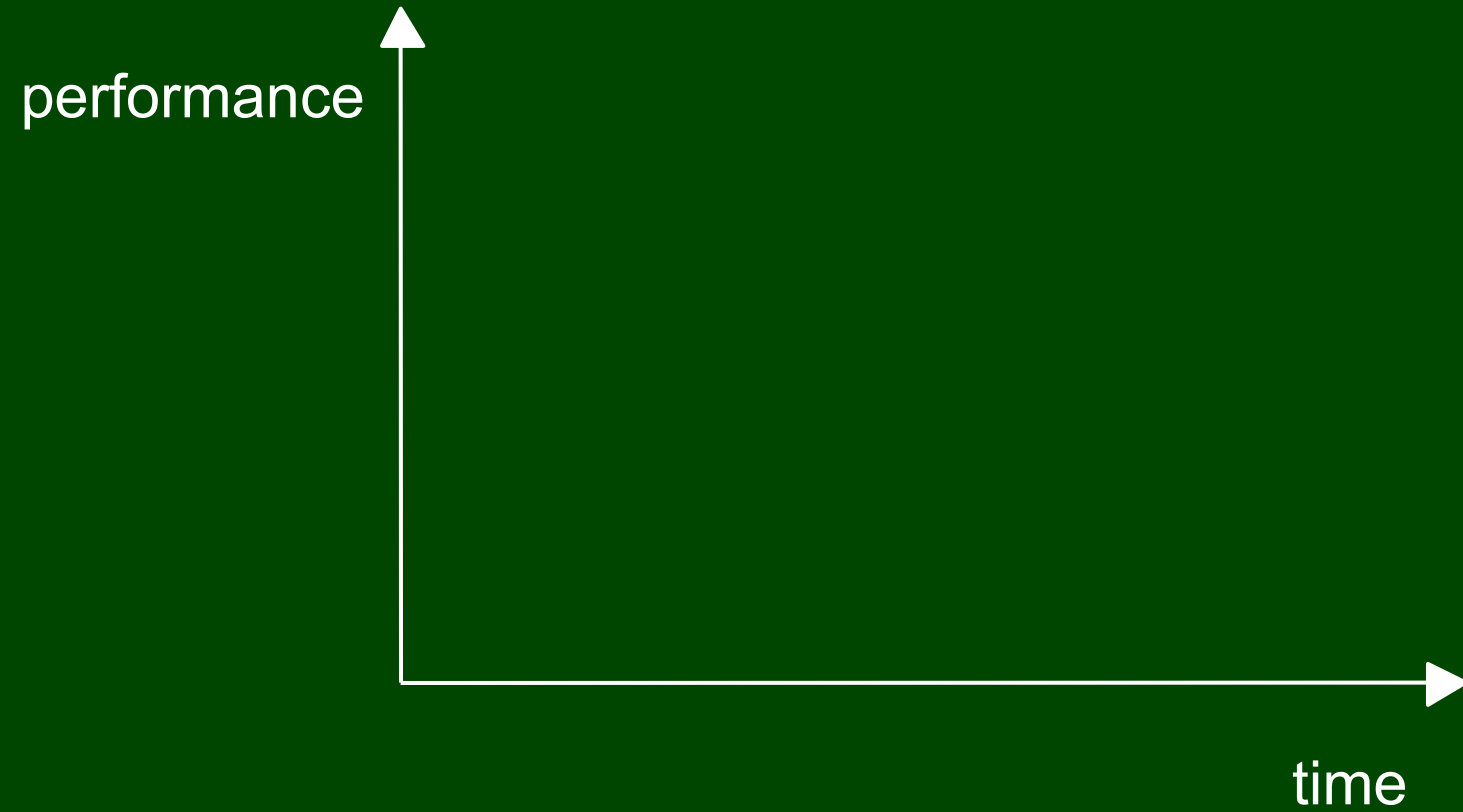
and for achieving them {
effectively
efficiently

MANAGEMENT OF TECHNOLOGY

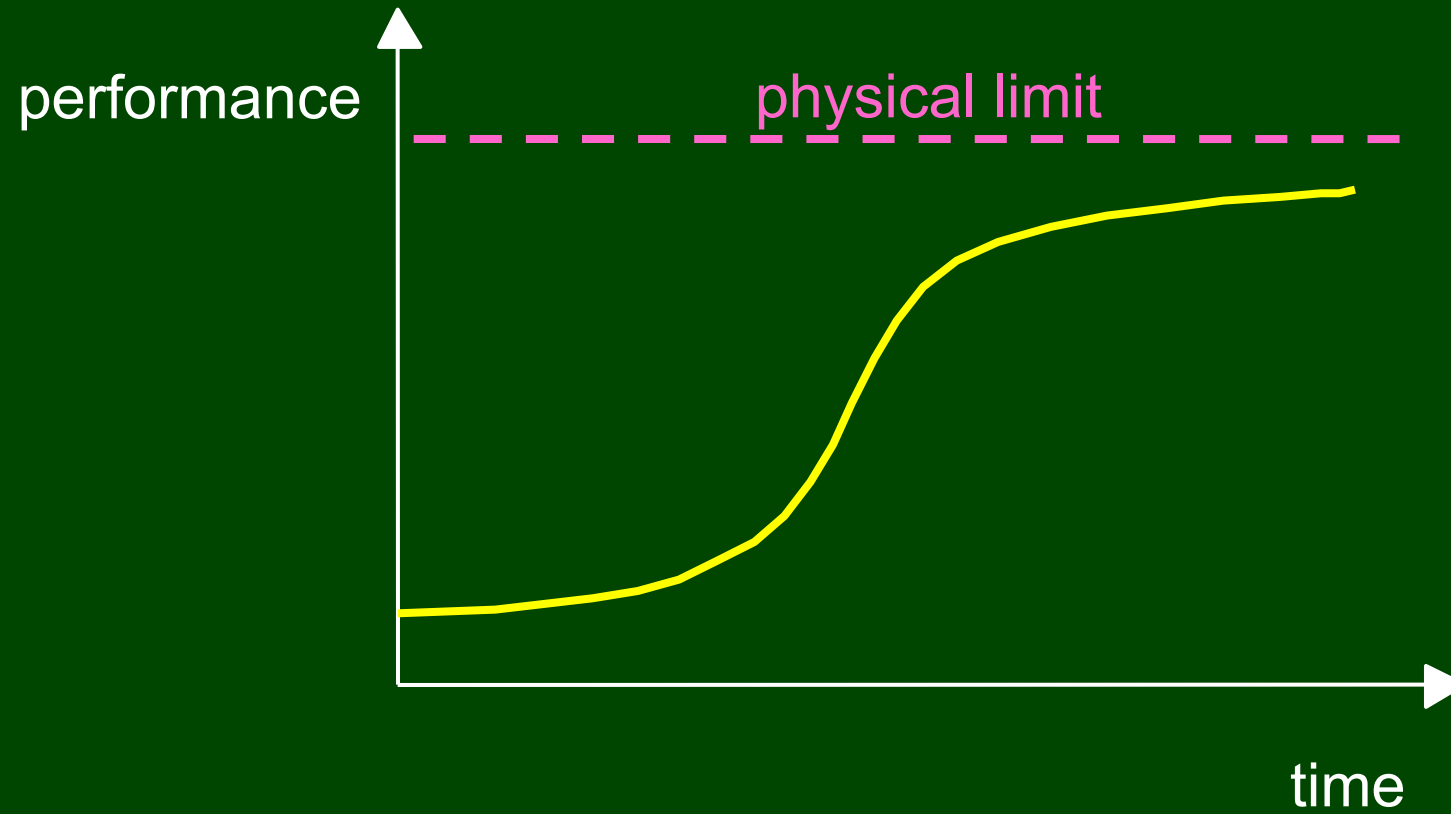
MANAGEMENT OF TECHNOLOGY

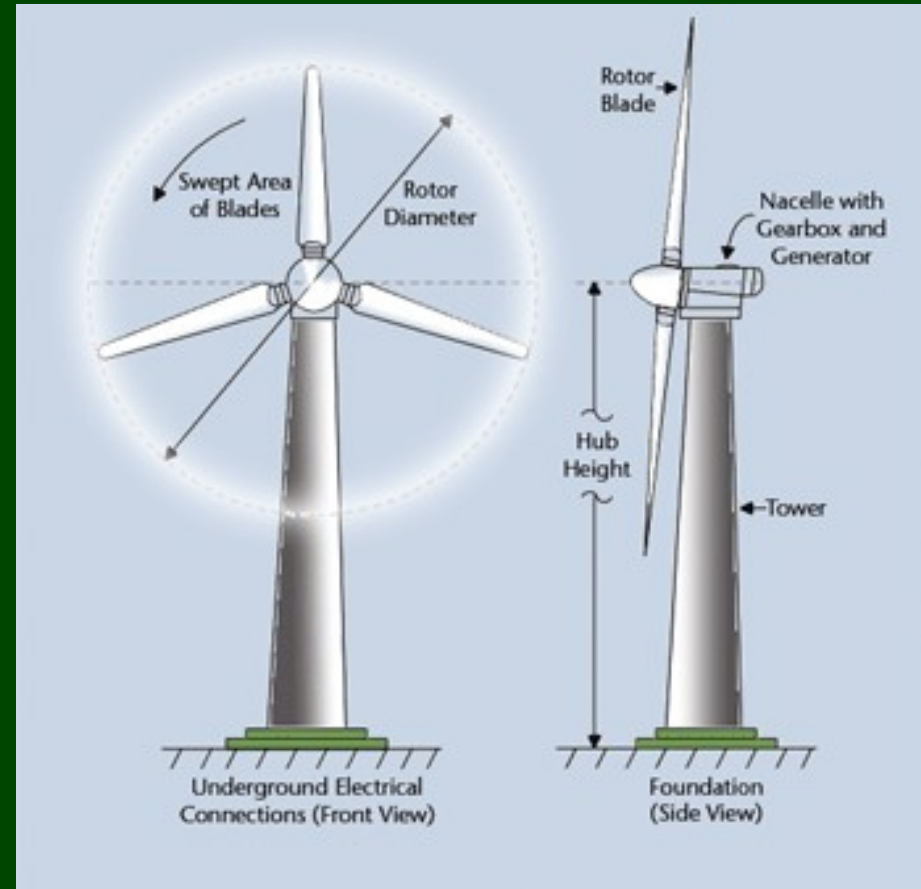
MoT is a cross-functional activity
that addresses how to develop, adapt, and exploit
technological capabilities
to accomplish the goals of an organization.

TECHNOLOGY LIFE CYCLES



TECHNOLOGY LIFE CYCLES



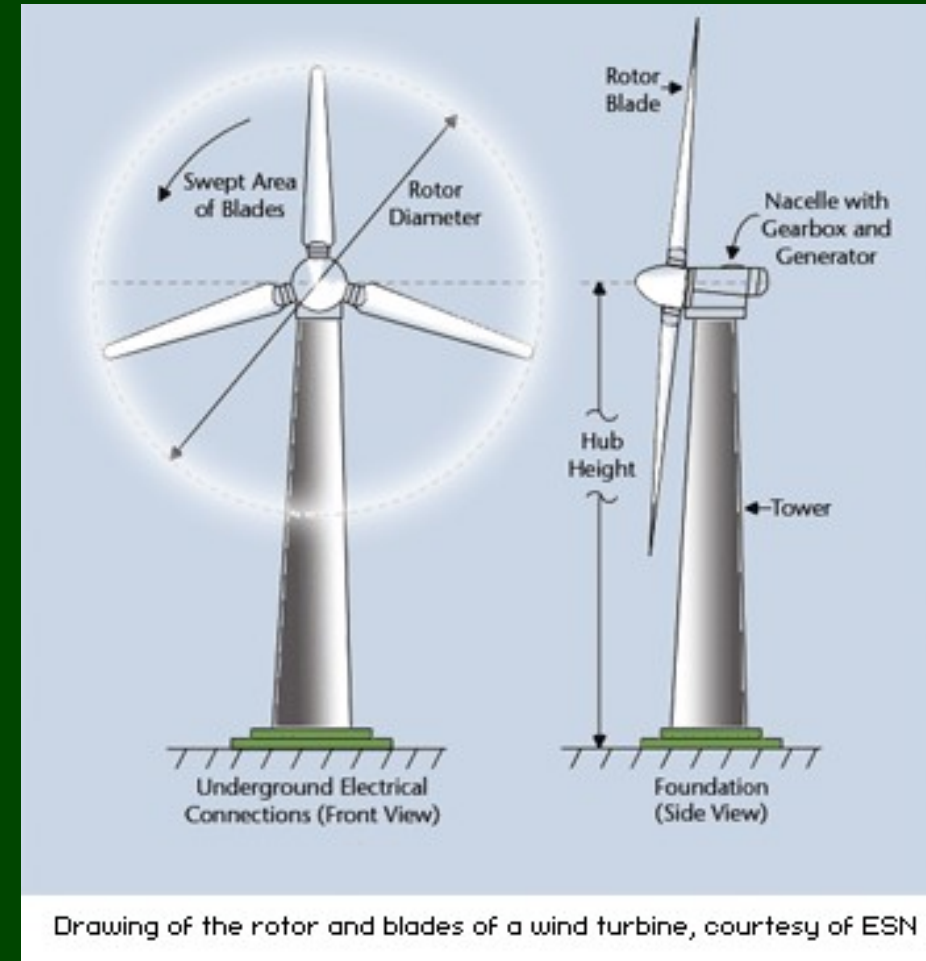


Drawing of the rotor and blades of a wind turbine, courtesy of ESN



Theoretical max. efficiency:

Betz number = $16/27$



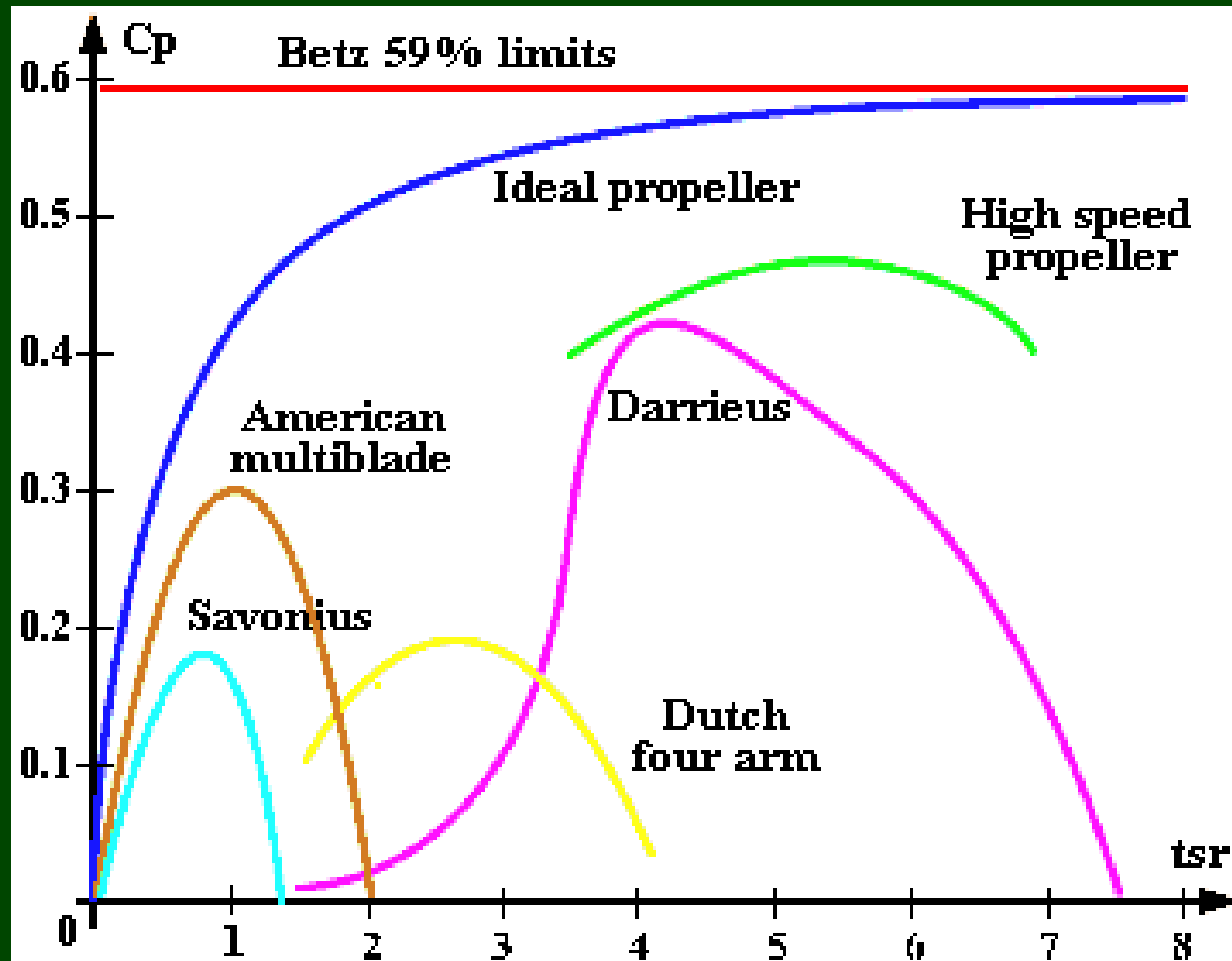
Drawing of the rotor and blades of a wind turbine, courtesy of ESN



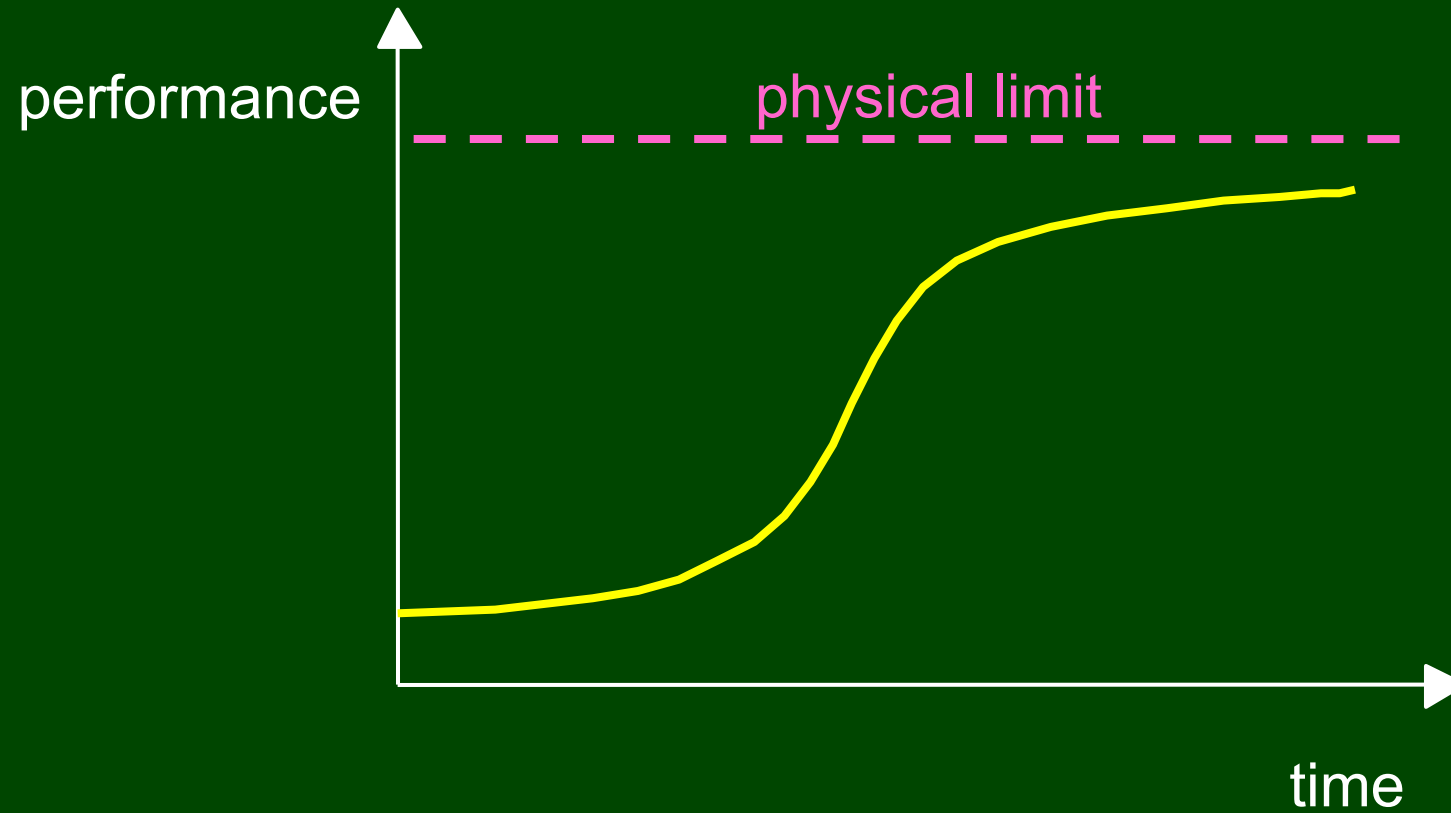




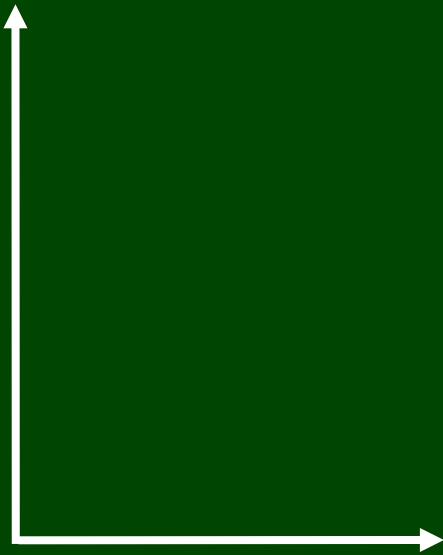




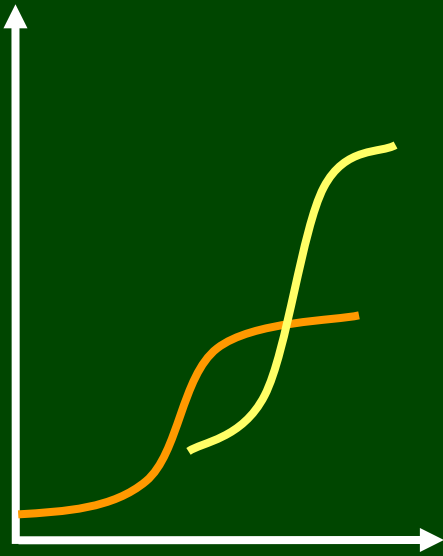
TECHNOLOGY LIFE CYCLES



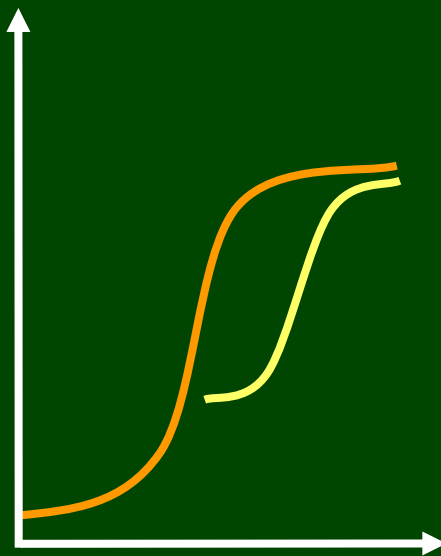
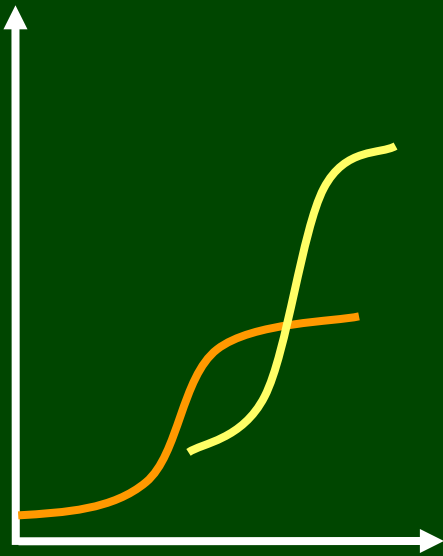
TECHNOLOGY LIFE CYCLES



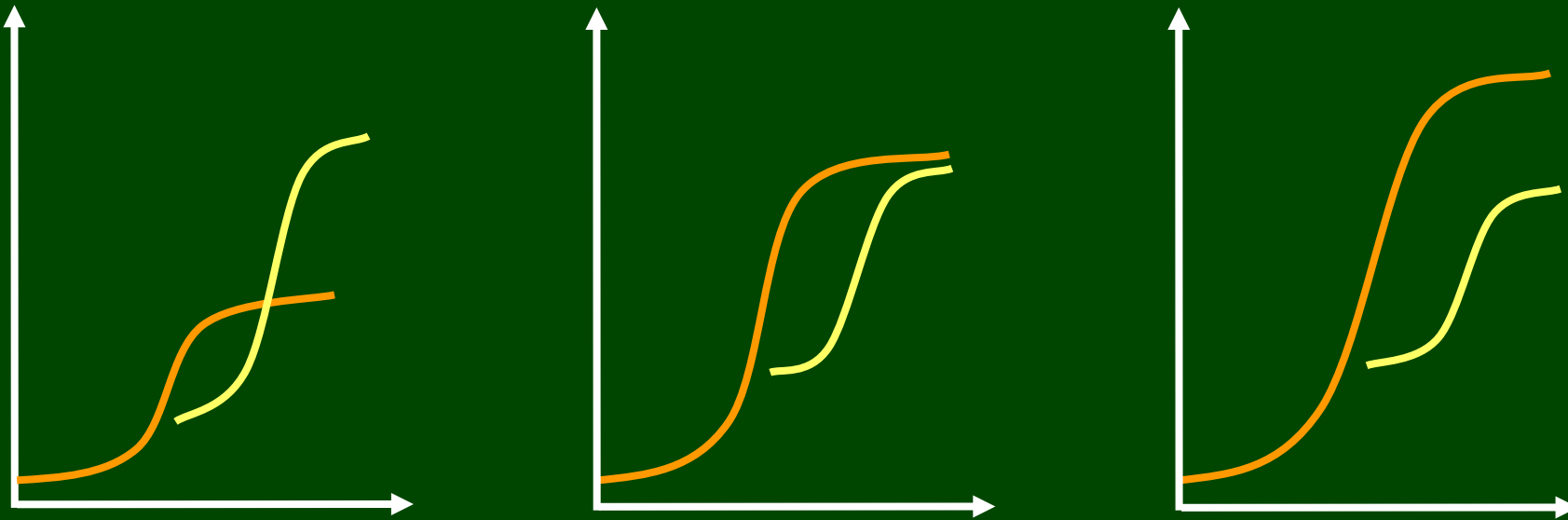
TECHNOLOGY LIFE CYCLES



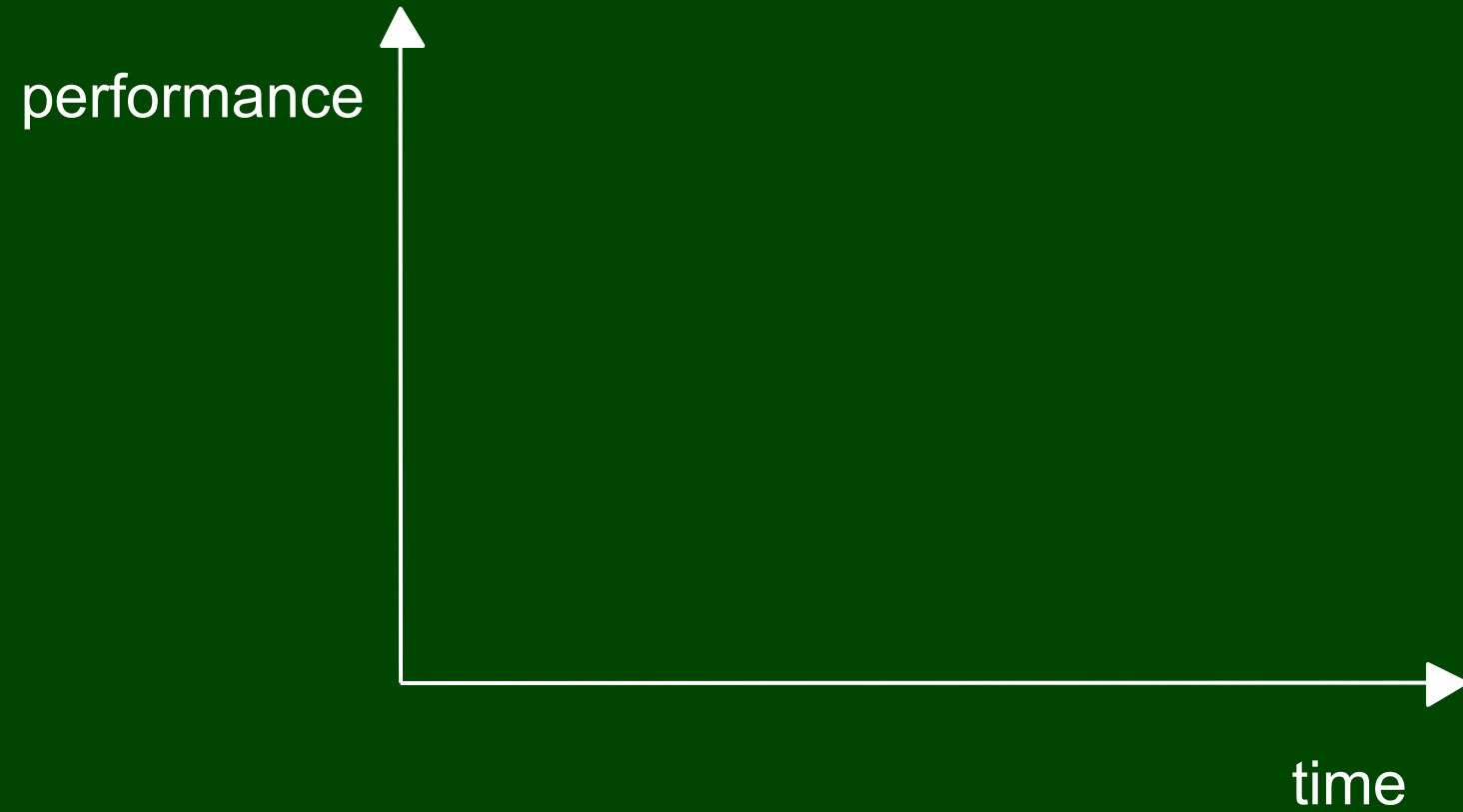
TECHNOLOGY LIFE CYCLES



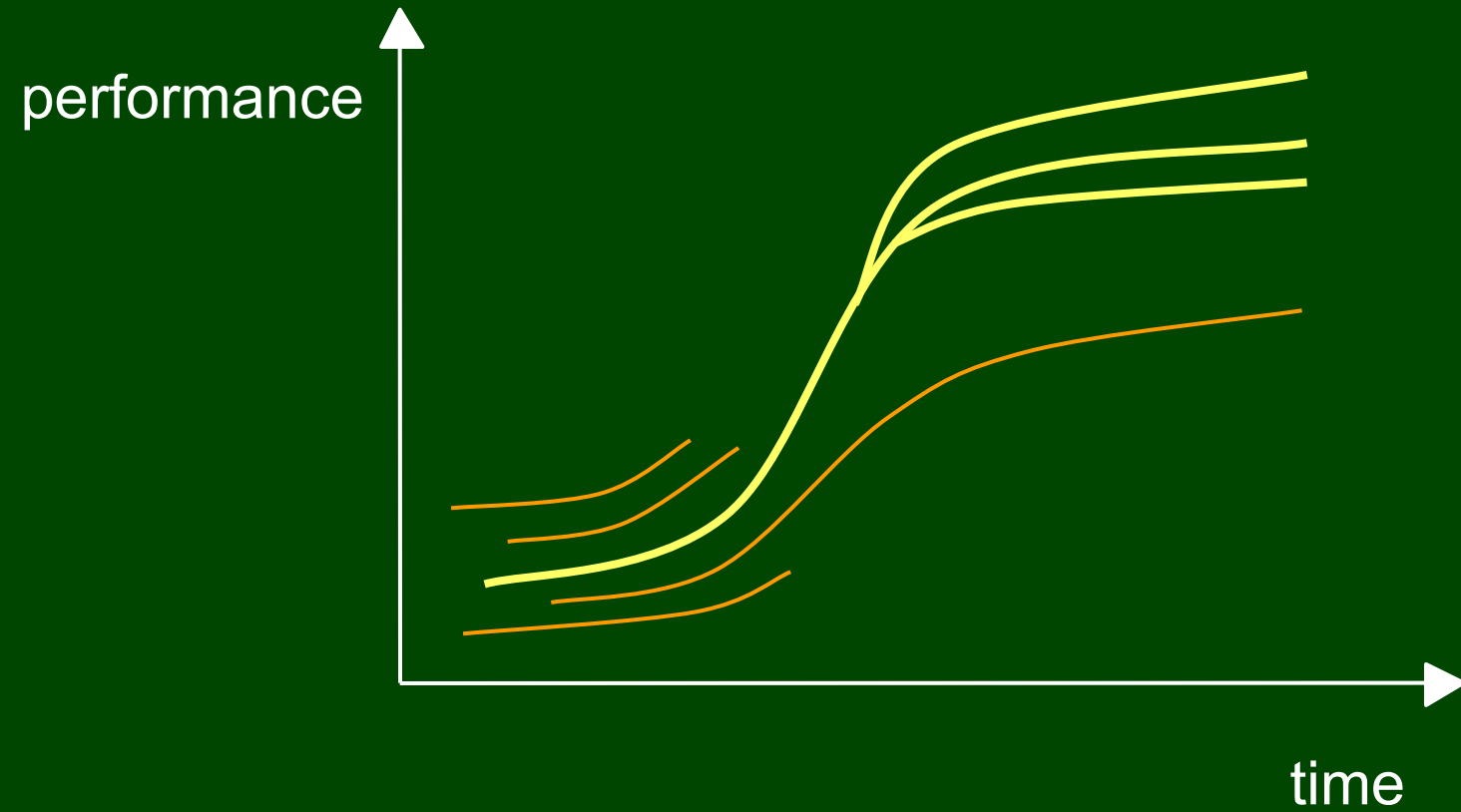
TECHNOLOGY LIFE CYCLES



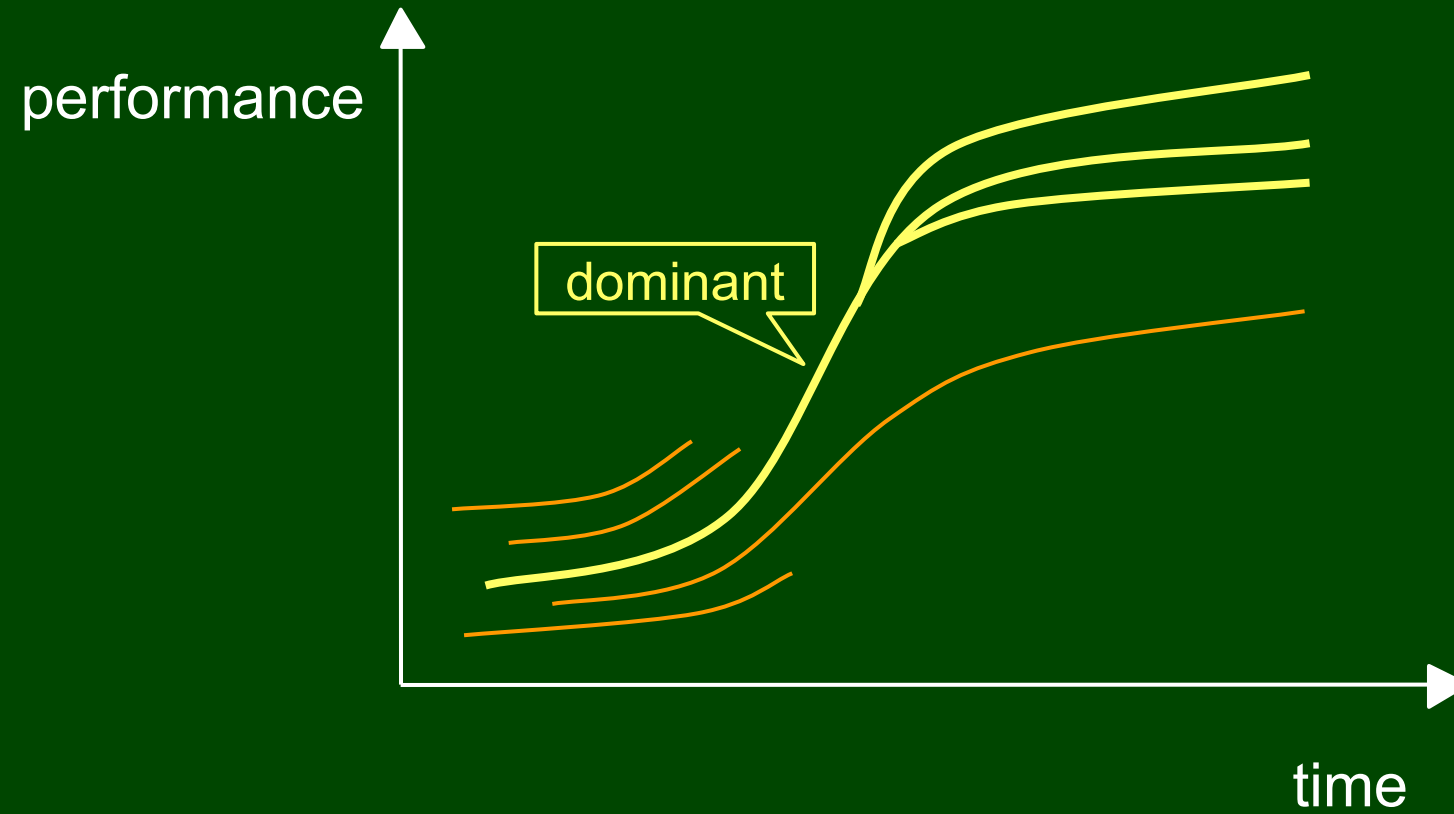
TECHNOLOGY LIFE CYCLES



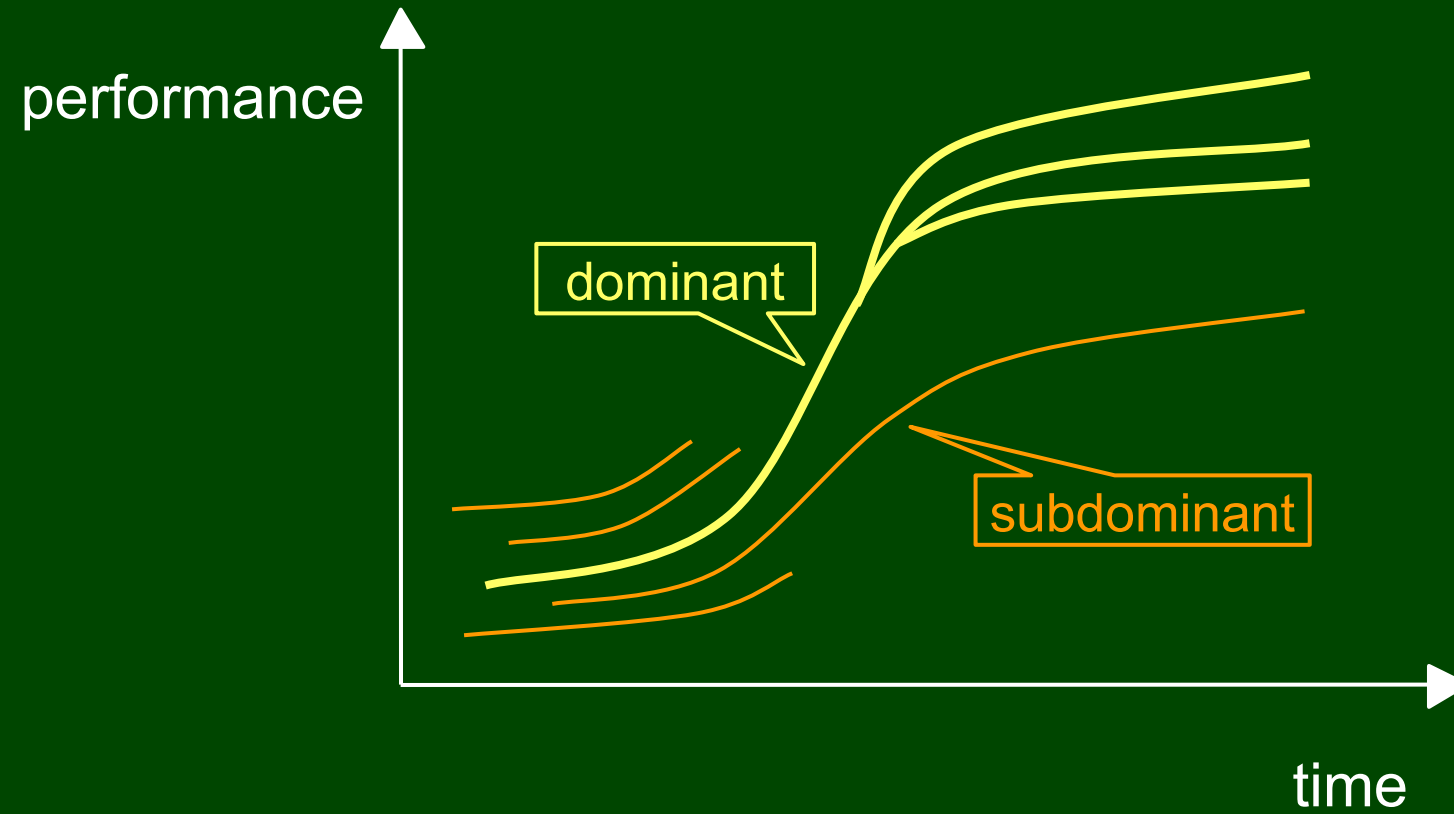
TECHNOLOGY LIFE CYCLES



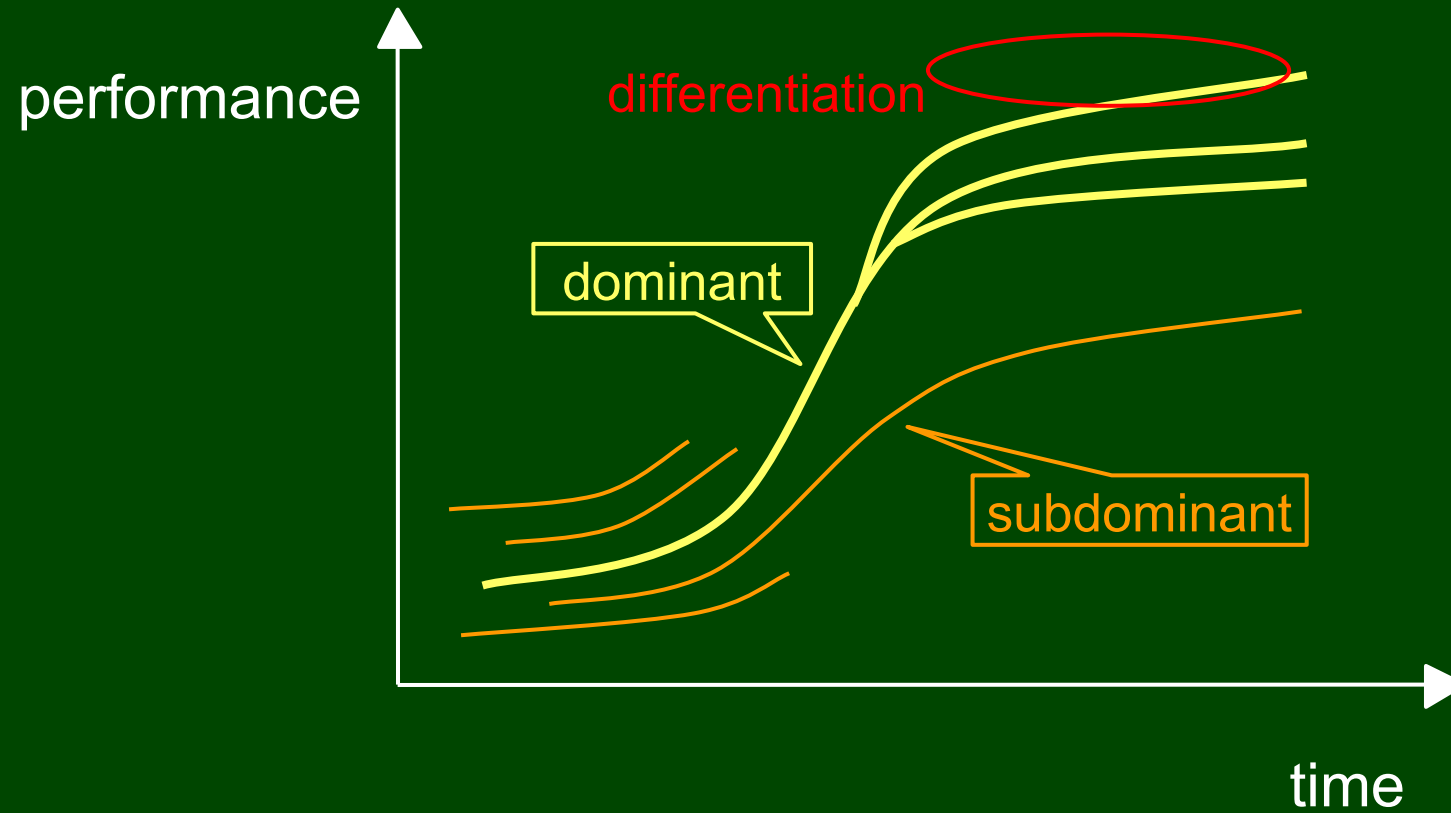
TECHNOLOGY LIFE CYCLES



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TECHNOLOGY LIFE CYCLES



TYPES OF DIFFERENTIATION

MARKET BASED

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- different price categories

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- different price categories
- different ways of usage

TECHNOLOGY BASED

TYPES OF DIFFERENTIATION

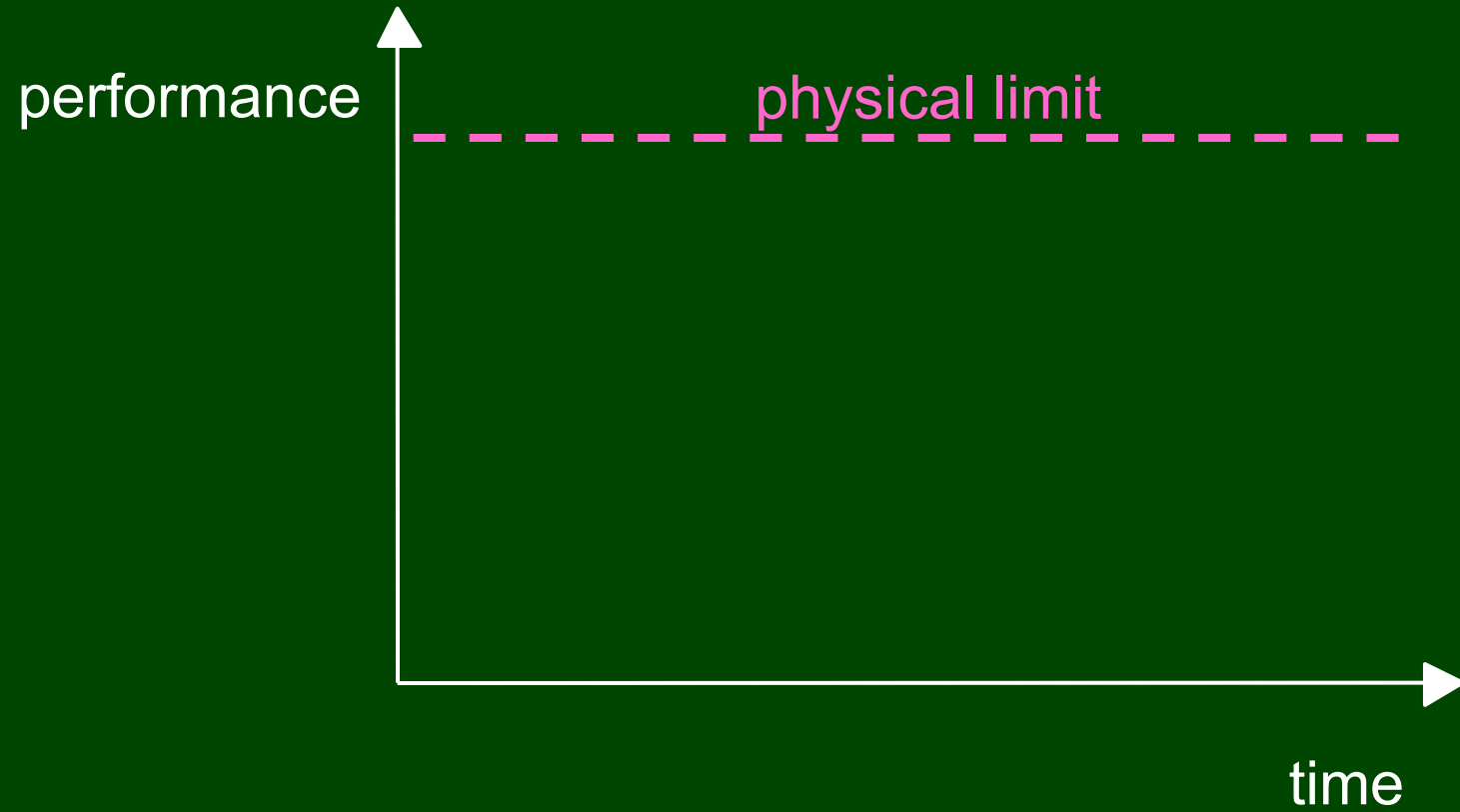
MARKET BASED

- different price categories
- different ways of usage

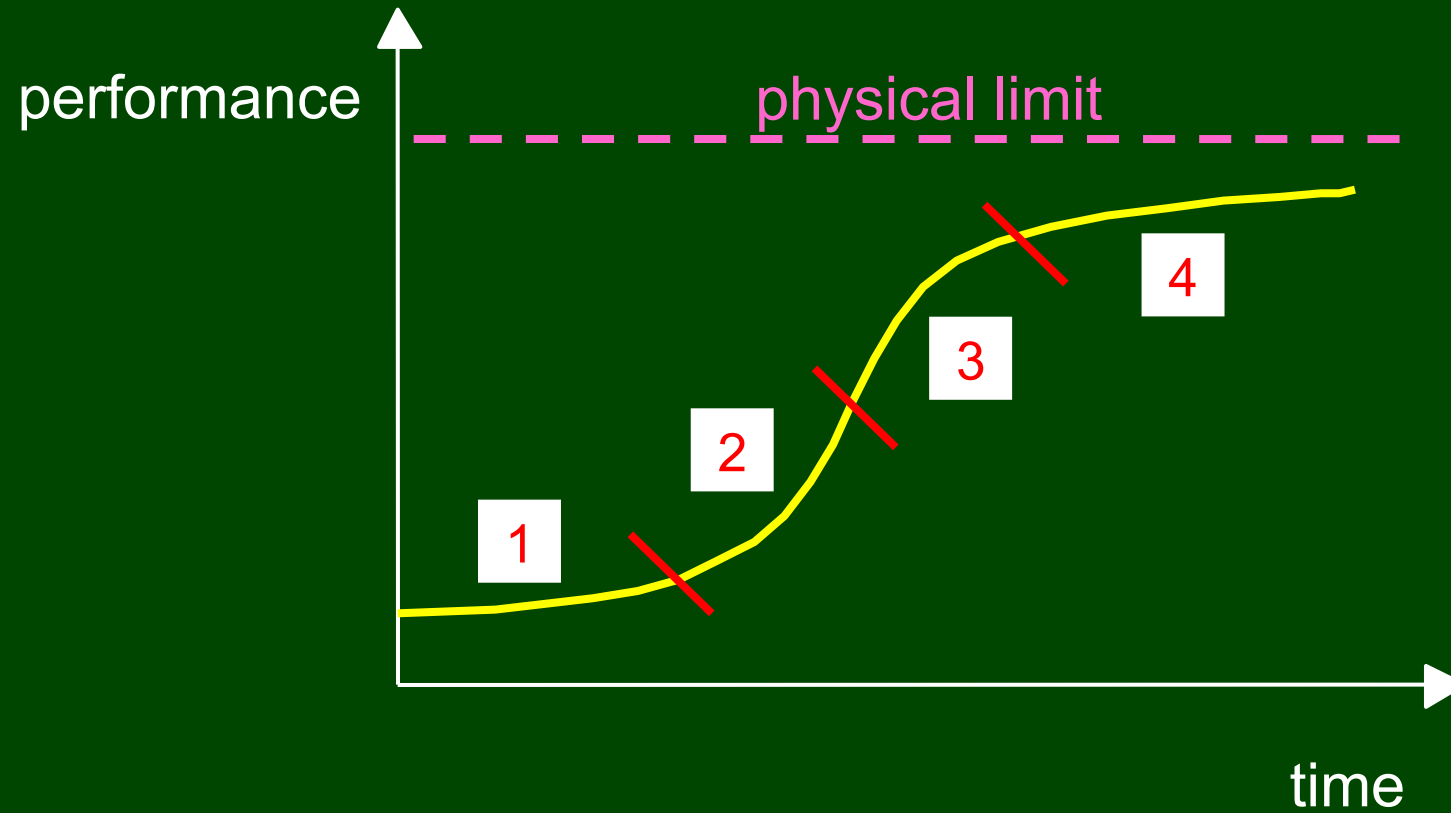
TECHNOLOGY BASED

- different technological concepts

TECHNOLOGY LIFE CYCLES



TECHNOLOGY LIFE CYCLES



TECHNOLOGY LIFE CYCLES

TECHNOLOGY LIFE CYCLES

STAGE 1

- Major uncertainties

TECHNOLOGY LIFE CYCLES

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- High level of investment with high risk to obtain marginal improvements in performance

TECHNOLOGY LIFE CYCLES

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TECHNOLOGY LIFE CYCLES

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- Underestimation of the period before it reaches the point of rapid growth

TECHNOLOGY LIFE CYCLES

STAGE 1

- Major uncertainties
- High level of investment with high risk to obtain marginal improvements in performance
- Low rate of growth
- High degree of optimism regarding the performance
- Underestimation of the period before it reaches the point of rapid growth
- Practical applications only in some special uses where earlier technologies are inadequate

TECHNOLOGY LIFE CYCLES

TECHNOLOGY LIFE CYCLES

STAGE 2

- Emerging body of knowledge („critical mass”) → rapid performance growth („chain reaction”)

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- Rapid succession of new products with significantly higher performance

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- Rapid succession of new products with significantly higher performance
- Quickness is more important than cost reduction for competitive advantage
- Business success needs strong r&d expertise and technological orientation of the organization
- Emergence of new venture companies

TECHNOLOGY LIFE CYCLES

TECHNOLOGY LIFE CYCLES

STAGE 3

- Dominant technologies emerge

TECHNOLOGY LIFE CYCLES

STAGE 3

- Dominant technologies emerge
- Market segmentation: different products designed to meet the needs of individual market segments

Philips
CD 100



Sony
CDP 101





Nokia
1011



Nokia
1011

IBM
Simon



TECHNOLOGY LIFE CYCLES

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- Product → technology differentiation (market-based, technology-based)

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- Product lives lengthen

TECHNOLOGY LIFE CYCLES

STAGE 3

- Dominant technologies emerge
- Market segmentation: different products designed to meet the needs of individual market segments
- Product → technology differentiation (market-based, technology-based)
- Product lives lengthen
- Product cost becomes more important

TECHNOLOGY LIFE CYCLES

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STAGE 4

- Physical limit is close → little scope for radical new products

TECHNOLOGY LIFE CYCLES

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- Increased competition for share in a saturated market

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TECHNOLOGY LIFE CYCLES

STAGE 4

- Physical limit is close → little scope for radical new products
- Increased competition for share in a saturated market
- Competition on price → reduced margin → need to reduce costs
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- Industrial concentration: emergence of a few dominant companies

TECHNOLOGY LIFE CYCLES

Characteristic	Stage of life cycle		
	2 nd	3 rd	4 th
Source of competitive advantage	new technology in (new) products	products for defined market segments	lower price, better quality
Main determinant of business success	research & development	marketing	production, quality management, cost accounting
Length of product life cycles			
Relative importance of quickness			
Relative importance of cost			

INNOVATION

INNOVATION

Schumpeter, 1934

INNOVATION

- introduction of a new product
- introduction of a new method of production
- opening of a new market
- development of a new source of supply for raw material or other input
- creation of a new organisation of industry

INNOVATION

INNOVATION

- product innovation
- process innovation
- marketing innovation
- organizational innovation

INNOVATION

- product innovation
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technological innovation

INNOVATION

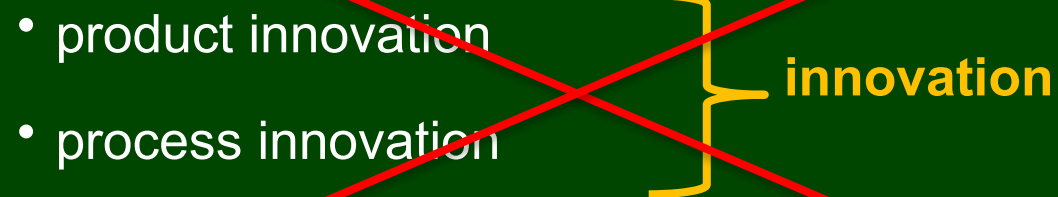
- product innovation
- process innovation

INNOVATION

- product innovation
- process innovation



INNOVATION

- 
- A diagram illustrating the components of innovation. It features a large red 'X' that crosses out a list of innovation types. To the right of the list, a yellow bracket groups the items, and the word 'innovation' is written in yellow. The red 'X' is composed of two diagonal lines that intersect in the center of the diagram.
- product innovation
 - process innovation
- innovation**

DISRUPTIVE INNOVATION

DISRUPTIVE INNOVATION

- PRODUCTIVITY

investment in a
technology



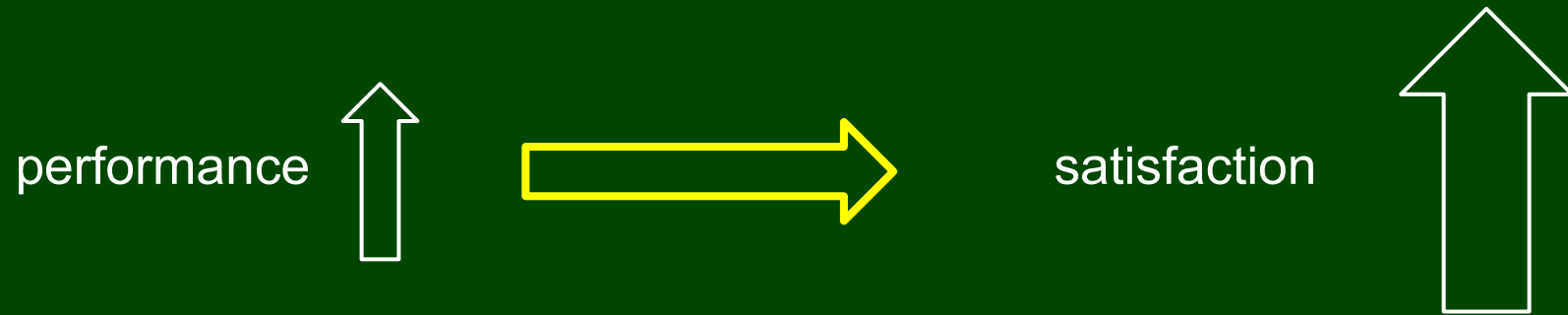
performance



DISRUPTIVE INNOVATION

DISRUPTIVE INNOVATION

- LEVERAGE



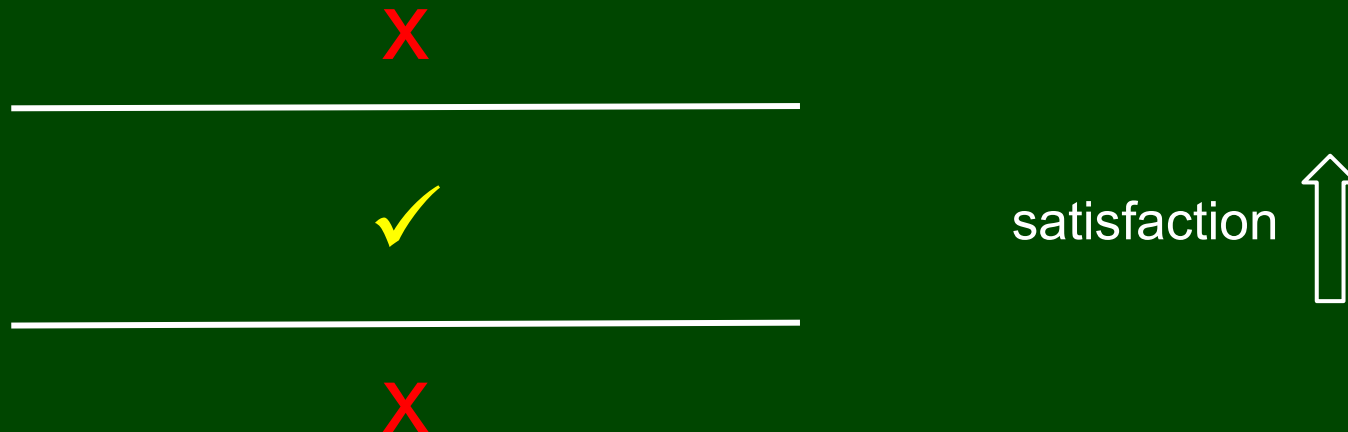
DISRUPTIVE INNOVATION

DISRUPTIVE INNOVATION

- LEVERAGE MINIMUM

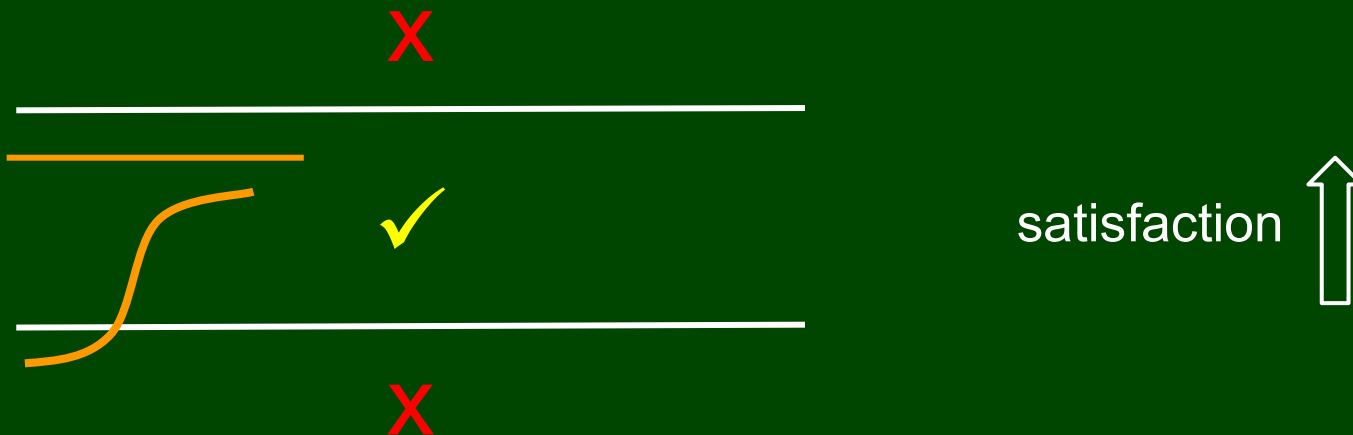
DISRUPTIVE INNOVATION

- LEVERAGE MINIMUM
- LEVERAGE LIMIT



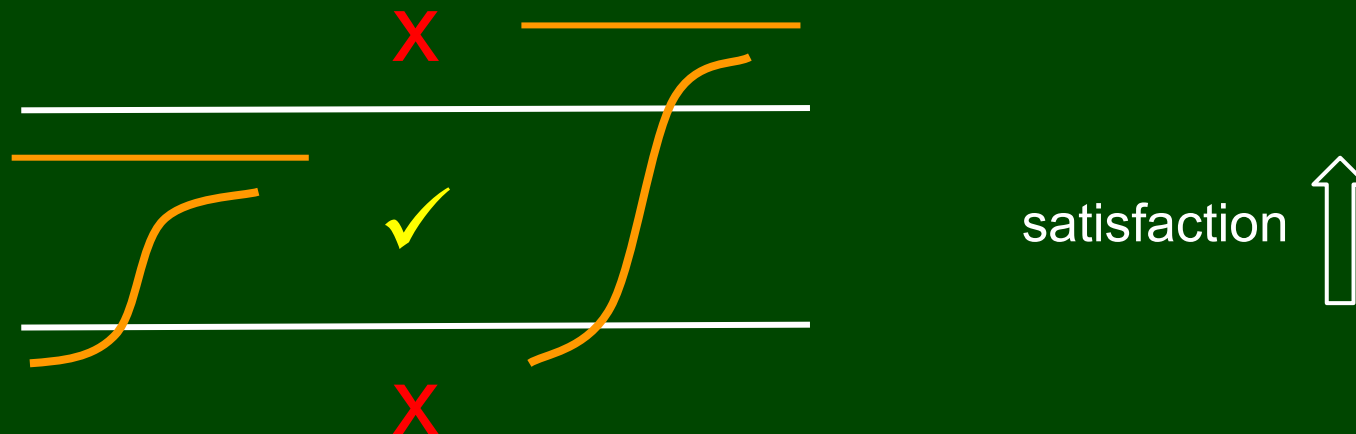
DISRUPTIVE INNOVATION

- LEVERAGE MINIMUM
- LEVERAGE LIMIT



DISRUPTIVE INNOVATION

- LEVERAGE MINIMUM
- LEVERAGE LIMIT



INNOVATIVE ORGANIZATIONS



INNOVATIVE ORGANIZATIONS

COLLECTIVE GENIUS



Hill et al., 2014

INNOVATIVE ORGANIZATIONS

COLLECTIVE GENIUS

- diverse people, wide-ranging ideas, debates



INNOVATIVE ORGANIZATIONS

COLLECTIVE GENIUS

- diverse people, wide-ranging ideas, debates
- trial and error, learning



INNOVATIVE ORGANIZATIONS

COLLECTIVE GENIUS

- diverse people, wide-ranging ideas, debates
- trial and error, learning
- "either-or" → "both-and" thinking

