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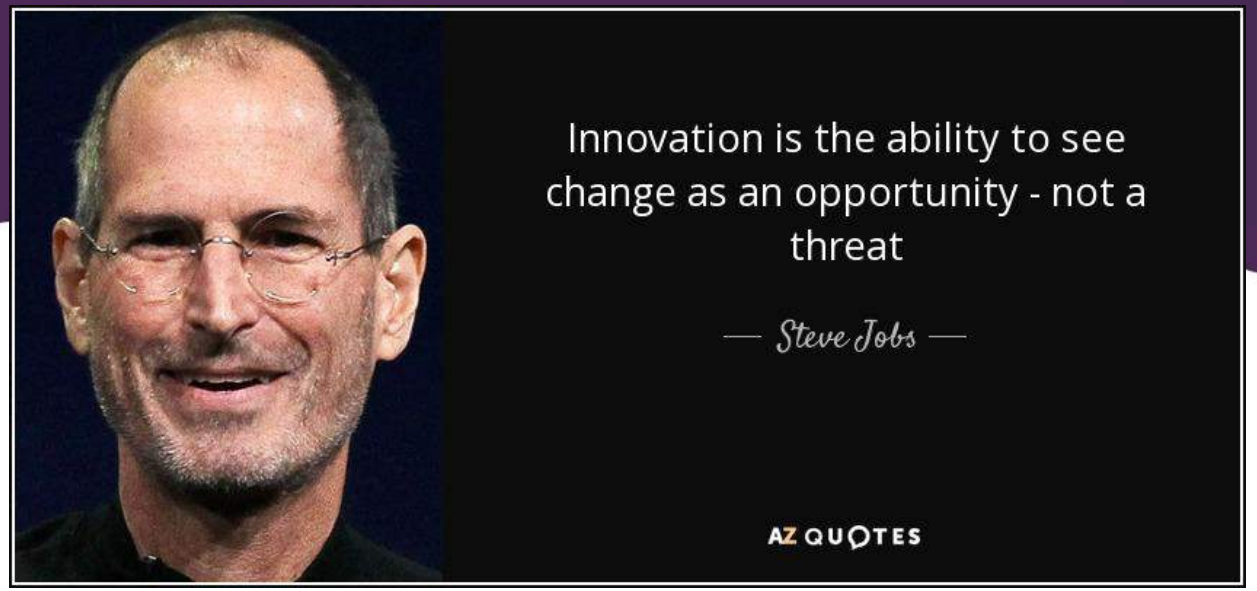

INNOVATION ENGINEERING
Building a perception

Hay Geraedts for I^2E^2 2021

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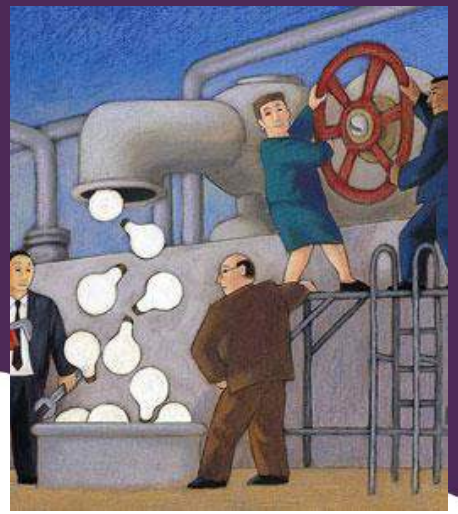
Content of the presentation

- Perception of innovation
- Innovation as a company driver for success
- OECD Global Innovation Index
- EPO: Global Patent Index
- What about creativity in an innovation development
- What can be seen as an Innovation process
- What are a valid set of Innovation criteria
- What should be a relevant set of capabilities to become an Innovator

Perception of innovation

- Kinds of Innovation
  - Product Innovation: Invent interesting new product ideas
  - Process Innovation: Invent new ways for processes/systems e.g. production systems
  - Market Innovation: Invent new markets
  - Organization Innovation: Invent new ways to organize the business

Perception of innovation



- The vitality and survival of companies in competitive markets depend to a large extent on their ability to innovate.
- Innovation is not something that emerges spontaneously from the activities of a company: companies need to invest in it!
- Whether companies produce end-user products, or subcontract deliver parts to end-user companies, or deliver services to customers, innovation stays important.
- It can sometimes be bought or found through collaboration with other companies ('open innovation').
- In any event, human capital is an important factor in innovation.

Perception of innovation

- Big companies commit considerable amount of money to scenario studies for innovation.
- Unlike bigger companies, small and medium-sized enterprises (SMEs) often lack financial resources to invest extensively in scenario studies.
- Responsible persons within SMEs often don't have enough perception on how to start innovation and don't dare to make the first step.
- The strategies of SMEs are more often based on survival tactics than on growth optimization.
- On the other hand SMEs are very flexible to act on changes on the market and to startup a innovation development trajectory.

Perception of innovation

- Sustaining national quality of living depend to a large extent to success of national companies
- Bigger companies are investing already a large amount of their turn over into innovation.
- And SMEs? Investing in innovation is uncertain!
- But it would make a big difference for the prosperity of a country and it's companies when they would be successful in innovation too.
- Initiatives in SMEs often depend on the capabilities/competencies of their engineer employees.

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ignite INNOVATION

- If professionals holding high education degrees were confident in how to take initiatives on innovation, this would be a key success marker for companies acting in their markets and therefore a key success factor for developing needed innovation!

- It is about: igniting innovation

Innovation: possible description

Innovation is an internal creative development process that contributes to entrepreneurial goals when developing new products, processes, organisational structures or market approaches, or some combination of these.

Technological, economic and psychosocial factors can be investigated when considering innovation development.

Generally, innovation is initiated by multidisciplinary teams consisting of key persons in companies.

Teams develop new or renewed products or services to sell on marketplaces.

When planning innovation development, corporate decision makers must have accurate information as a basis for funding innovation projects.

Innovation: important words

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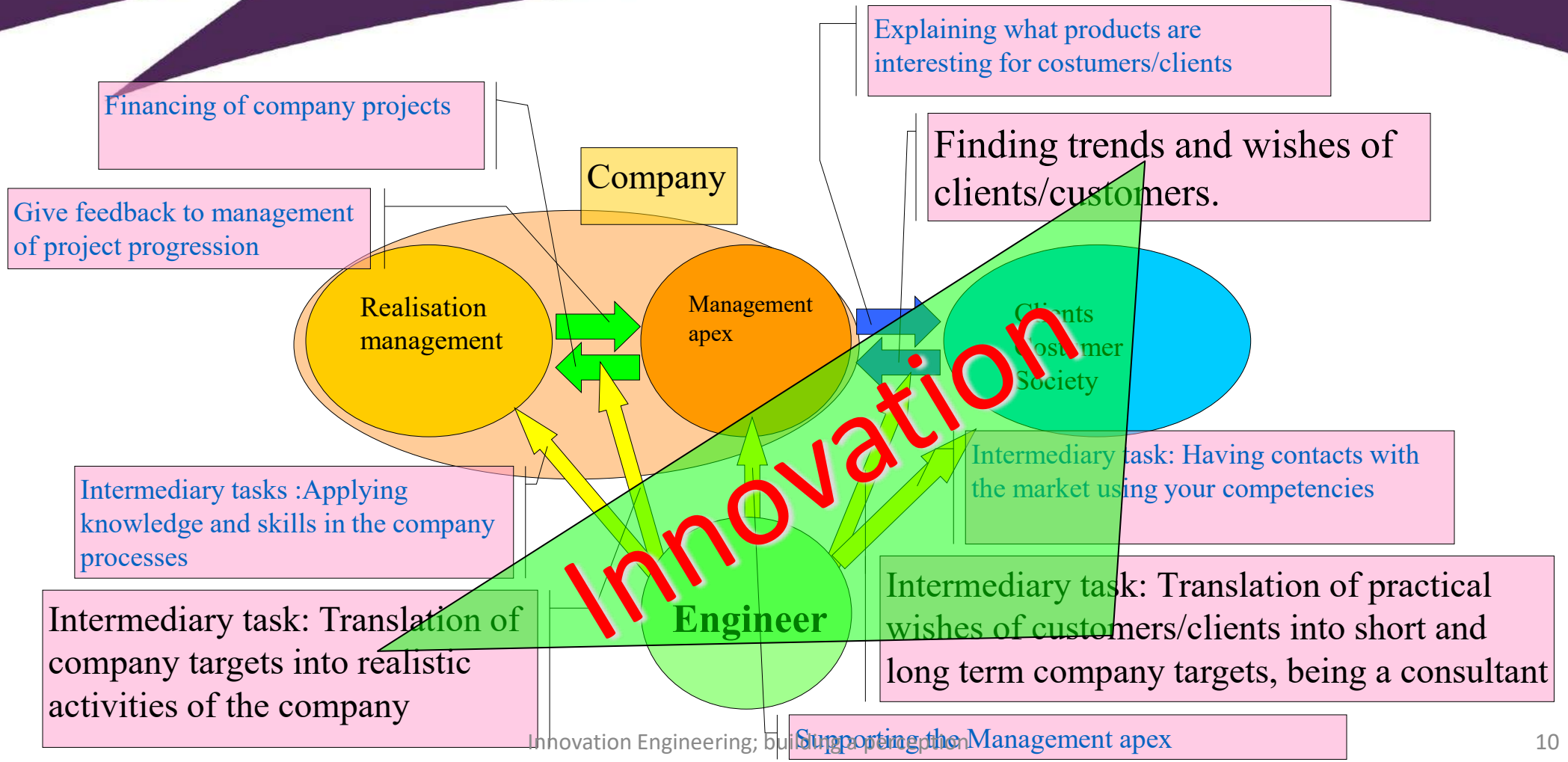
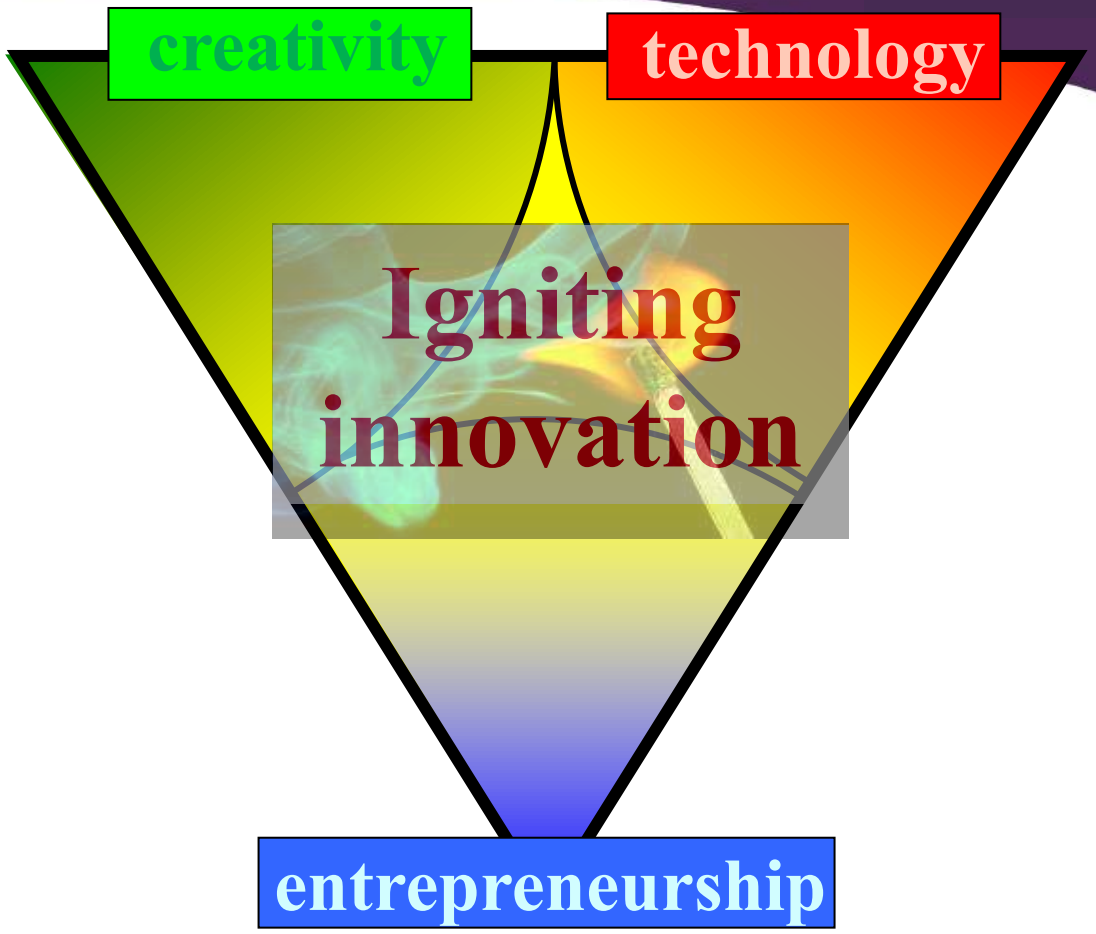
Innovation in companies

Tasks for Engineers in companies

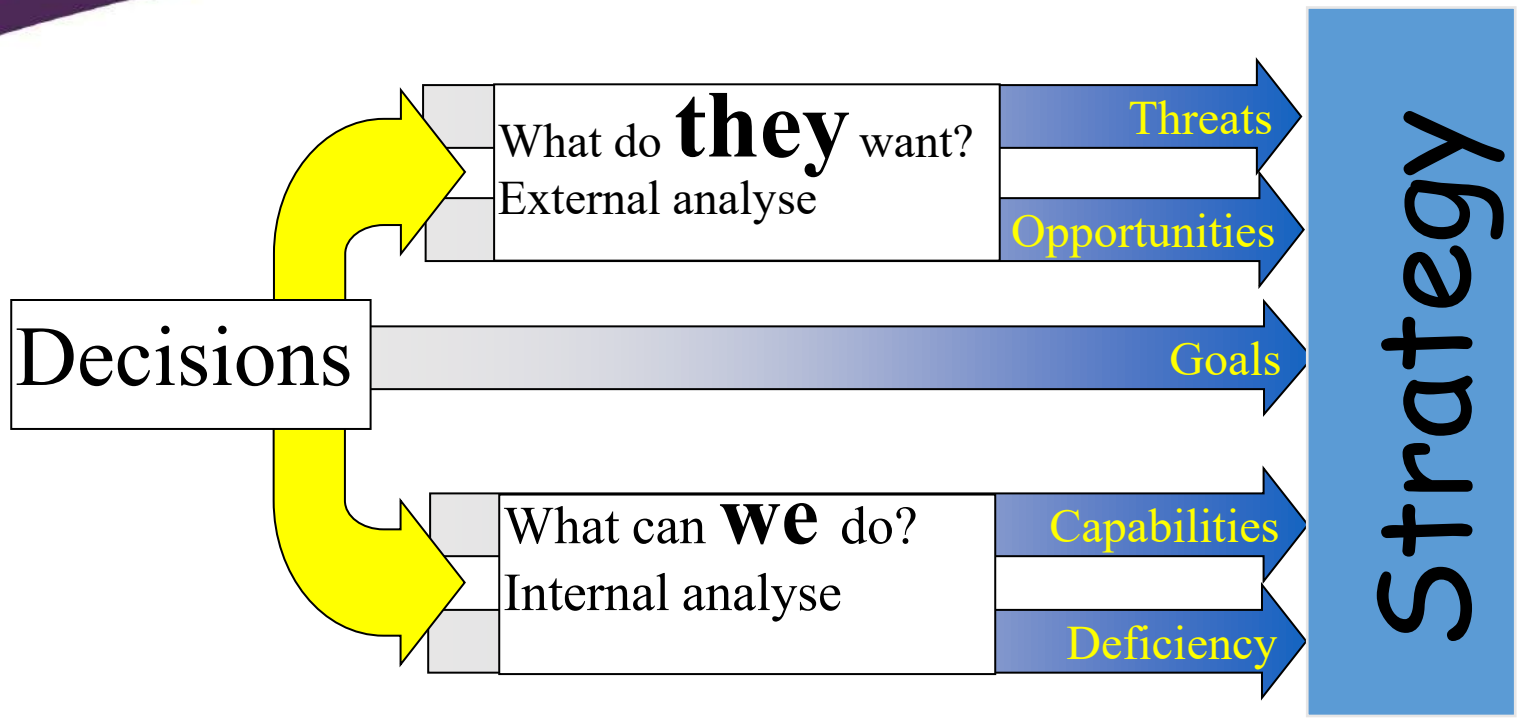


Innovation: 1st order context of engineer

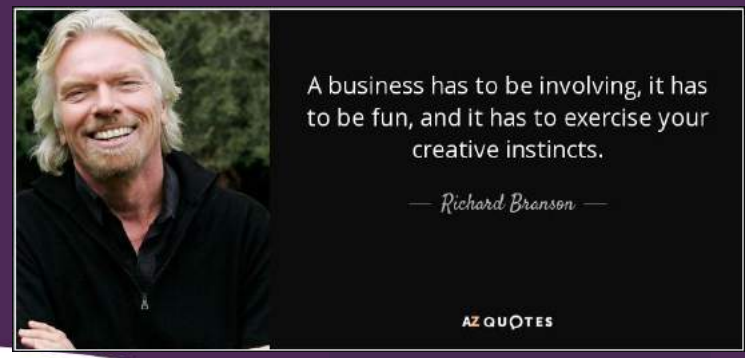
Innovation is an internal **creative** development process that contributes to **entrepreneurial** goals when developing new products, processes, organisational structures or market approaches, or some combination of these. **Technological**, economic and psychosocial factors can be investigated when considering innovation development. Generally, innovation is initiated by multidisciplinary teams consisting of key persons in companies. Teams develop new or renewed products or services for sale in marketplaces. When planning innovation development, corporate decision makers must have accurate information as a basis for funding innovation projects.



SWOT: Strength, Weaknesses, Opportunities, Threats

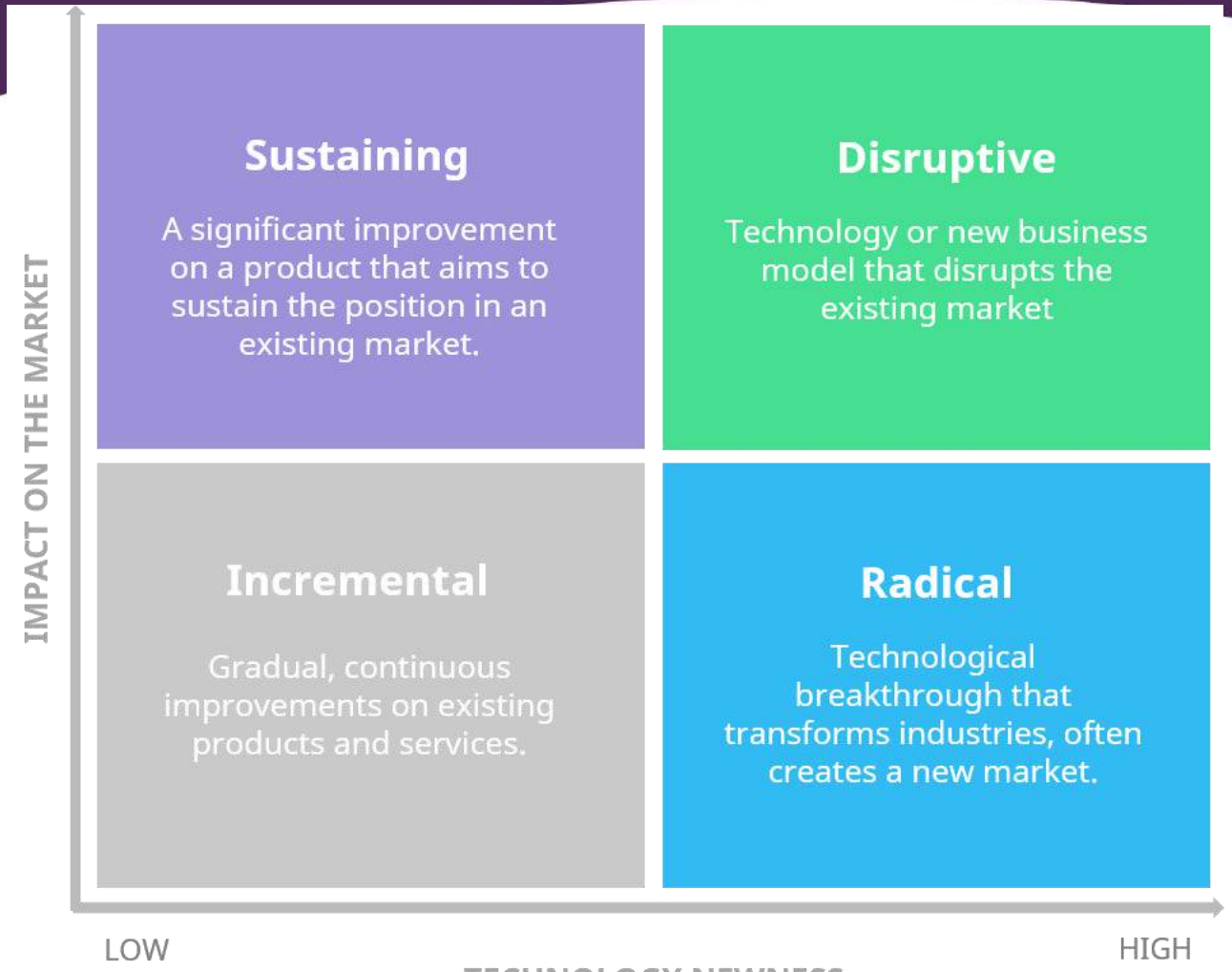


Innovation developments seen from a SWOT analysis



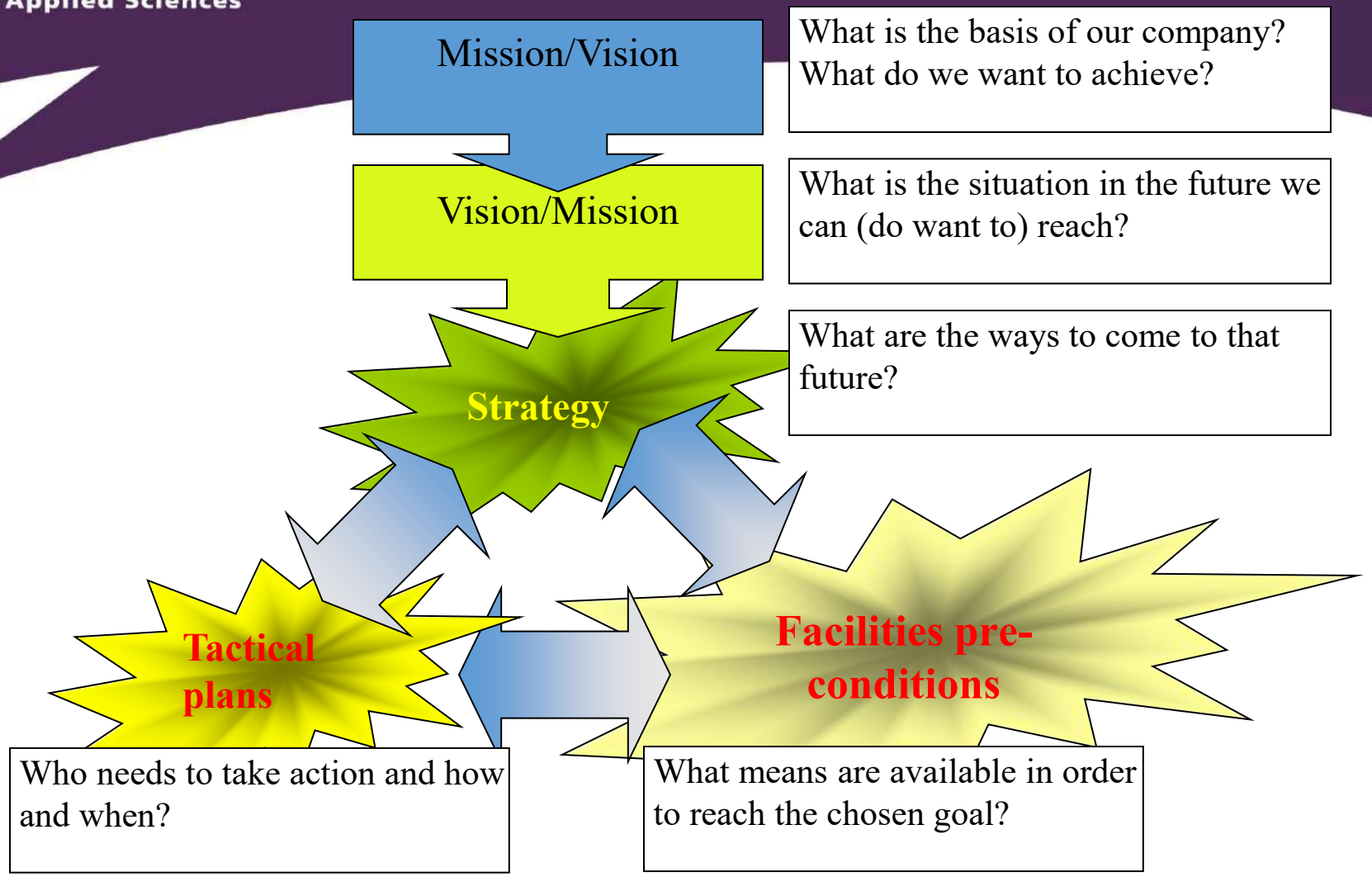
		Internal aspects: Capabilities	Internal aspects: Deficiencies
	SWOT confrontation matrix	Capabilities	Deficiencies
External aspects	Opportunities	Earn a lot of money **Incremental innovation**	Enable your employees **Organisational innovation**
External aspects	Threats	Investigate market conditions **Market innovations**	Find possibilities to grow into new markets **Structural innovation**

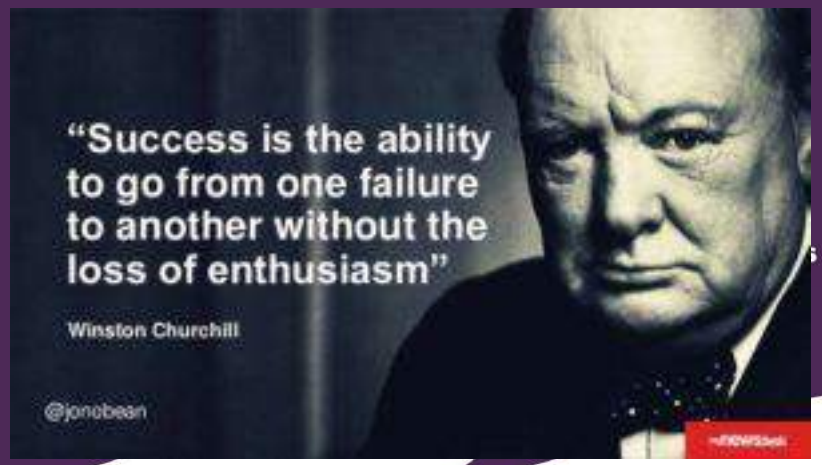
Types of Innovation



Where do you start?

A global determination





MAIN DRIVER FOR INNOVATION

STRATEGICAL DECISION MAKING

STRATEGICAL DECISION MAKING

STRATEGICAL DECISION MAKING

Saying: There is always sunshine after the rain

Innovation saying: There is always rain after the sunshine!

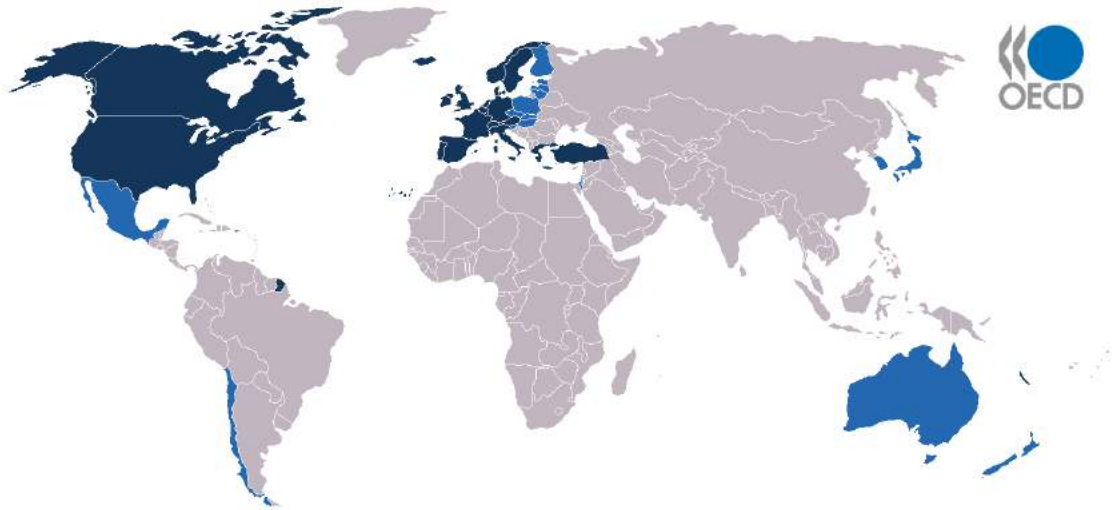
Innovation dilemma's

- Time dilemma's
  - Investing now, not knowing what result it will bring in the future market
  - Decisions now, for activities in the future, not knowing what the best trajectory is.
- Quality dilemma's
  - What extra functions do customers pay attention to in the future?
  - Time-to-market needs to be short whereas quality assurance takes more time.
- Sustainability dilemma's
  - Innovative products will not stay innovative for long whereas companies want to make much money from one innovation
  - Your competitor will innovate this product faster or too long and competitor has overtaken the market.
- Financial dilemma's
  - Shortage of financial resources to invest in innovation versus probably higher turn over when investing in innovation.
  - Investing comes before earning the money

What to do ?????

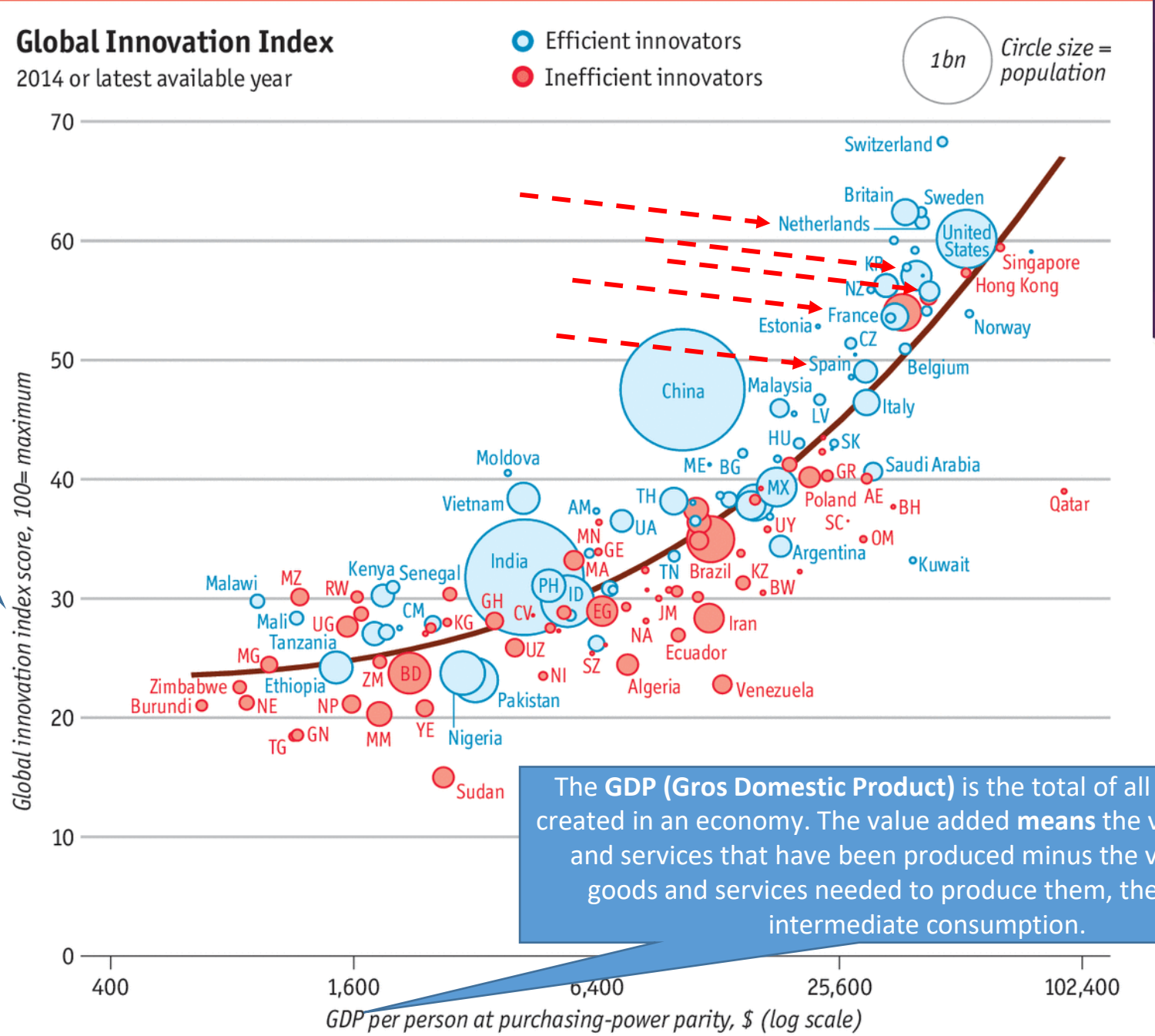
OECD researches e.g. effectiveness of innovation development in partner countries

- The Organisation for Economic Co-operation and Development (**OECD**) is an international organisation that works to build better policies for better lives. Our goal is to shape policies that foster prosperity, equality, opportunity and well-being for all.



OECD Global Innovation Index

The Global Innovation Index (GII) provides detailed metrics about the innovation performance of 131 countries and economies around the world.

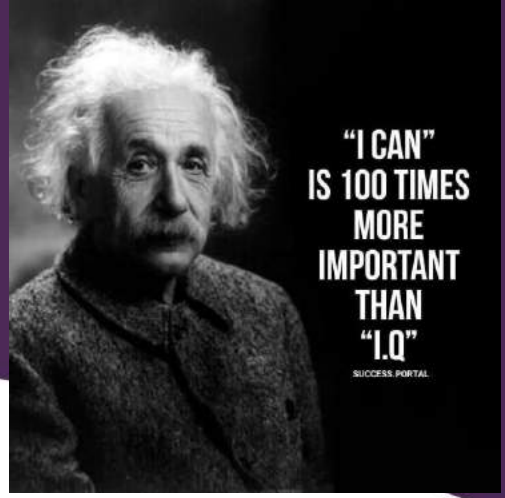


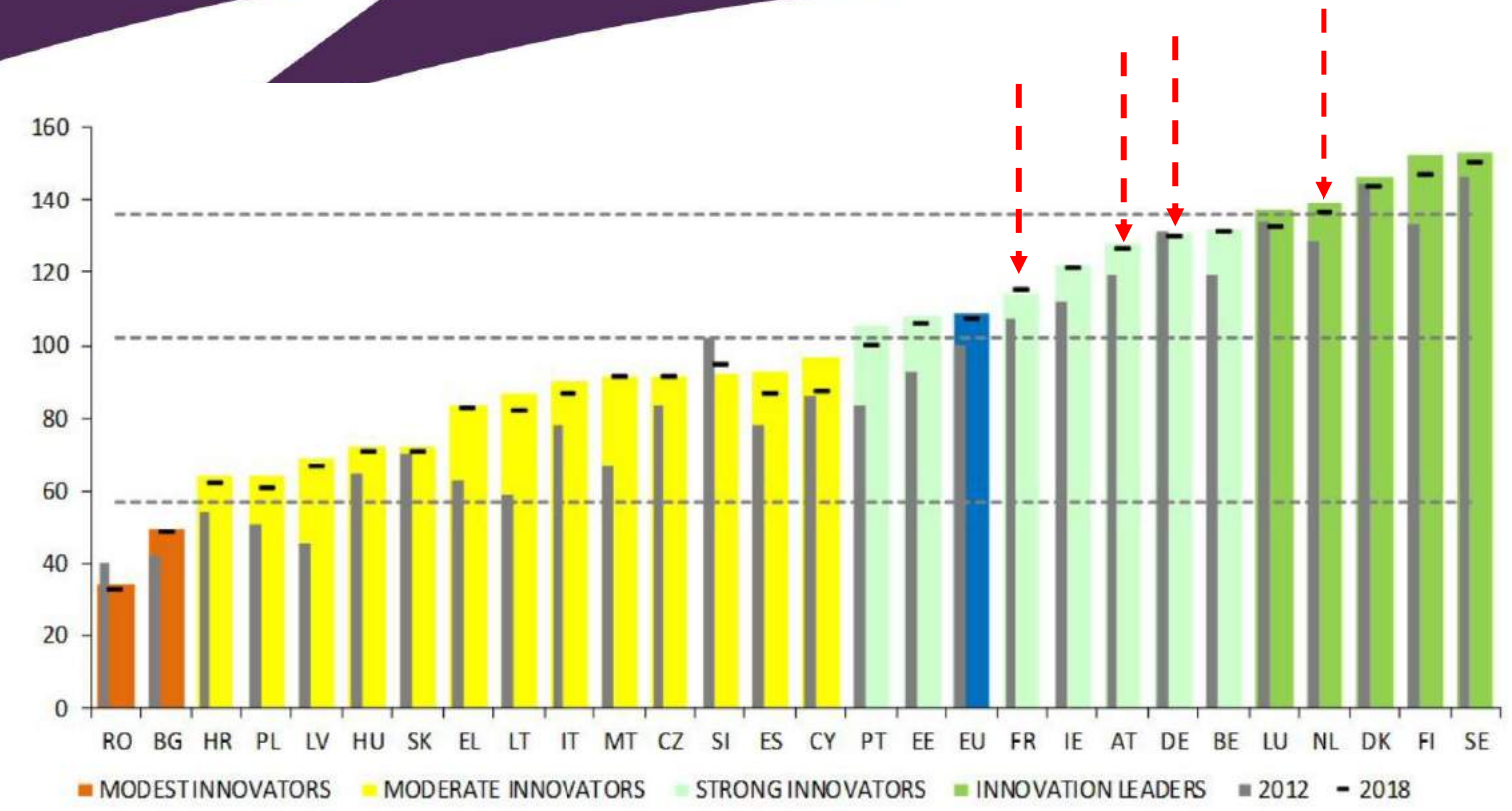
The **GDP (Gros Domestic Product)** is the total of all value added created in an economy. The value added **means** the value of goods and services that have been produced minus the value of the goods and services needed to produce them, the so called intermediate consumption.

Source: Global Innovation Index, 2015

Economist.com

OECD Global Innovation Index





European Innovation Scoreboard country ranking. Coloured columns show innovation performance in 2019, horizontal hyphens show performance in 2018, and grey columns show performance in 2012, all relative to the EU average in 2012.

Europe has strong innovation companies.

Engineers need to take place in this innovation arena in order to keep this strong position in the future.

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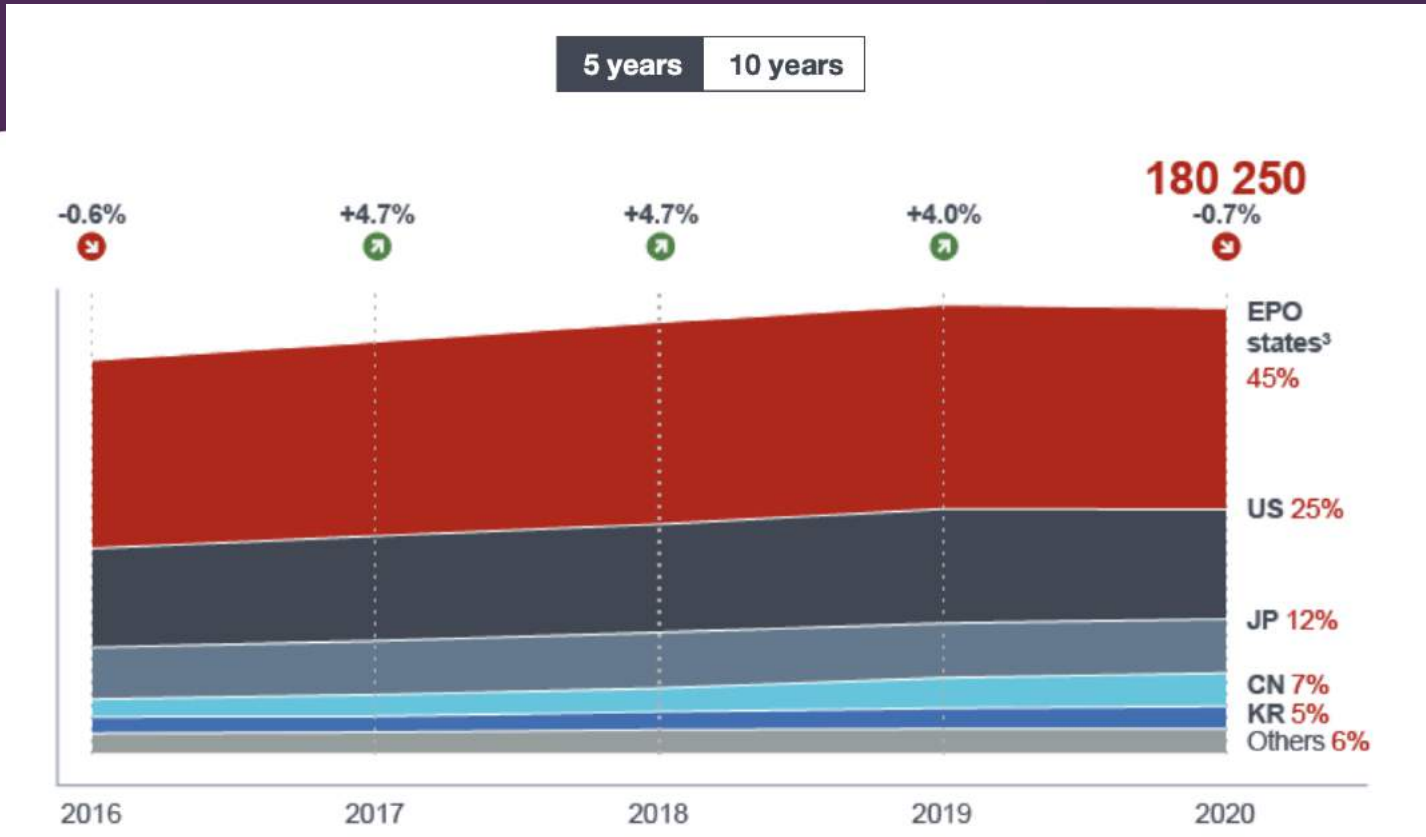
Europäisches Patentamt
European Patent Office
Office européen des brevets

EPO: Global Patent Index

Number of patents acquired in a country is an indicator for a level of innovation development



Source: EPO.
Status: 1.2.2021.

[1] European patent applications include direct European applications (Direct) and international (PCT) applications that entered the European phase during the reporting period (PCT regional).

[2] In cases where several applicants are mentioned on the application form, the country of residence of the first applicant listed applies.

[3] EPO states: the 38 member states of the European Patent Organisation, which includes the 27 states of the EU.

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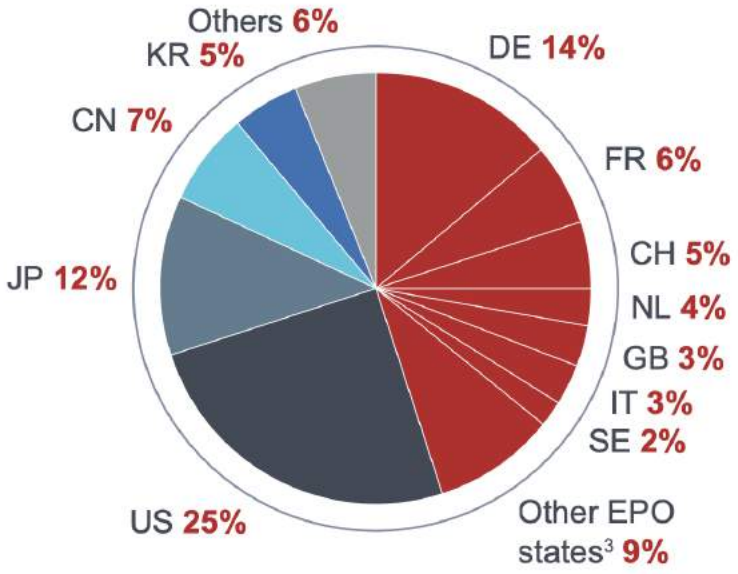
Europäisches Patentamt
European Patent Office
Office européen des brevets

Origin of the European patent applications

This graph shows the geographic origin of the European patent applications[1] determined by the country of residence of the first applicant listed on the application form (first-named applicant principle[2]).



Country	2020	2019	Change
US	44 293	46 177	-4.1%
DE	25 954	26 762	-3.0%
JP	21 841	22 086	-1.1%
Other EPO states[3]	15 710	15 358	2.3%
CN	13 432	12 227	9.9%
FR	10 554	10 233	3.1%
Others	10 135	10 149	-0.1%
KR	9 106	8 339	9.2%
CH	8 112	8 266	-1.9%
NL	6 375	6 942	-8.2%
GB	5 715	6 129	-6.8%
IT	4 600	4 469	2.9%
SE	4 423	4 395	0.6%

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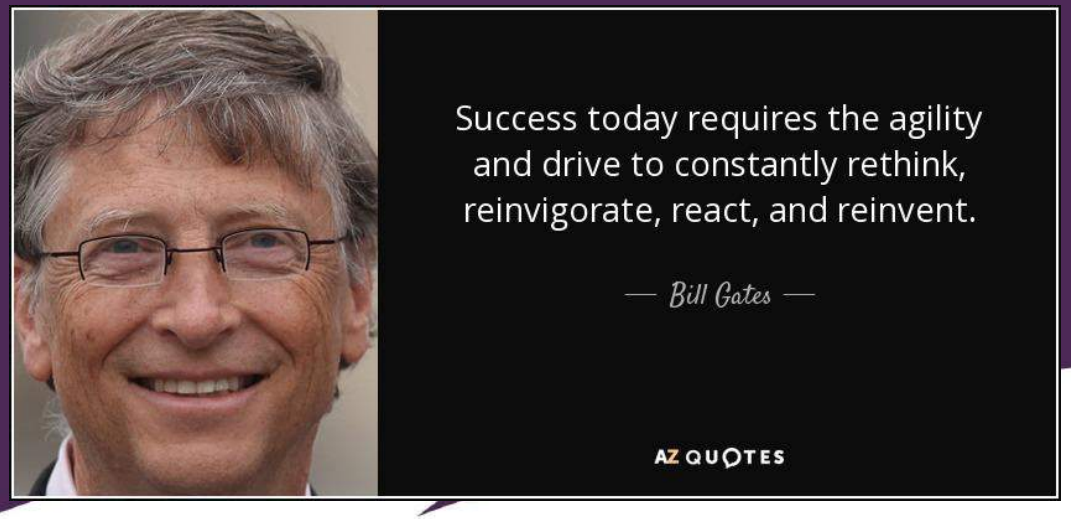
EPO: Global Patent Index

Number of patents

Technical Field		2020	2019	Change
Electrical engineering	Electrical machinery, apparatus, energy	11 346	10 297	0.4%
	Audio-visual technology	4 474	4 278	4.6%
	Telecommunications	3 982	4 047	-1.6%
	Digital communication	14 122	13 978	1.0%
	Basic communication processes	1 071	1 079	-0.7%
	Computer technology	13 097	12 859	1.9%
	IT methods for management	2 413	2 499	-3.4%
	Semiconductors	3 197	2 984	7.1%
Instruments	Optics	4 250	4 229	0.5%
	Measurement	8 582	9 048	-5.2%
	Analysis of biological materials	1 303	1 358	-4.1%
	Control	3 354	3 264	2.8%
	Medical technology	14 295	13 935	2.6%
Mechanical engineering	Handling	4 399	4 760	-7.6%
	Machine tools	3 594	3 711	-3.2%
	Engines, pumps, turbines	4 386	5 249	-16.4%
	Textile and paper machines	2 443	2 636	-7.3%
	Other special machines	6 261	6 419	-2.5%
	Thermal processes and apparatus	2 666	2 674	-0.3%
	Mechanical elements	3 821	4 220	-9.5%
	Transport	9 020	9 540	-5.5%

Relation to Mechatronics and mechanics



Strategic Decision-Making for Innovation

What are the relevant future perspectives?

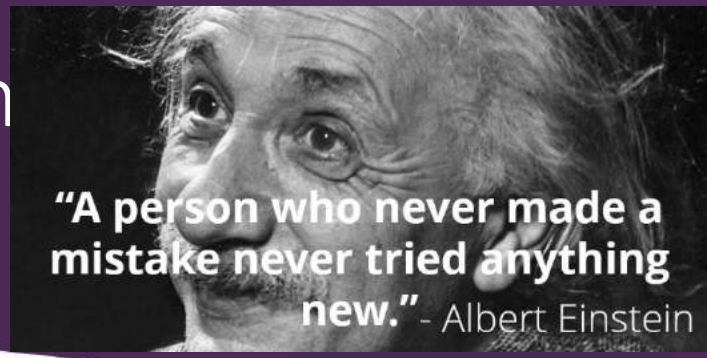
Tushman:

"Decision by itself changes nothing.

At the moment decisions are made, we don't know their effects.

We spent far more time on the consequences."

What about creativity in an innovation development



Brainstorming without having a picture how this process has to be organized is not effective and not efficient.

Don't brainstorm if you don't know how to do it and if you are not properly prepared.

Better use pre-conditioned methods.

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TRIZ: There is a workshop on TRIZ!!

Theory of Inventive Problem Solving

2021

page A, - 40 principles of innovation, presented schematically

page B - 40 principles of innovation, presented schematically

01) DIVISION

a) a ship built, made of removable / replacable bulkheads
b) multi-engine aircraft
c) multi-piston engine of internal combustion
d) a toy made from Lego blocks
e) a chocolate broken into mini-tablets
f) multi-grip gators
g) a binded file of paper sheets
h) multi-blade cartridge razors
i) multi-blade airscrews of aircrafts, or wind power-plants

02) TAKING OUT

a) taking of notoriously noisy power aggregate out of the main boat
b) internal air ventilation system taken out of the building, i.e. placed on the building elevation
c) sound of predator bird, previously registered on a tape and played back, can be used scaring the birds, notoriously flying near or around the airports

03) LOCAL QUALITY

a) dustless excavation of coal - the dust is captured by tiny droplets inside of the water cone - bigger droplets outside of the cone keep the dust in a place
other examples:
b) weighed average from marks
c) weighed estimation produced for rankings of computers, printers, etc.

04) ASYMMETRY

a) pneumatic tyre asymmetrically reinforced from outside, due to contact with pavement curb
b) left- or right-handed rules of priority, in right of road
c) slanted concrete mixer, blender,
d) asymmetrically built conjuctions, handles
e) asymmetrically defined functionality of the "trap-the-door" mechanisms

05) MERGING

a) several computers combined into functionning network
b) a hedge made of pales
c) textiles made of wool/poliestre/cotton fibres
d) roofing tiles combined into coverage of house roof
e) mobile concrete mixer, mobile crane, refridgerator, merged into single mobile machine unit, combining of the stationary machines with mobile undercarriages

06) UNIVERSALITY

a) a helmet in use, within field conditions, rendered as:
a1) spade
a2) frying pane
b) universal "handy-tools" Swiss Army knife
c) sets of universal kitchen robots, mixers, with operating acuators (rasps, juice extractors, etc.)

07) EMBEDED STRUCTURES (nested "Dolls" - Matryoshka)

a)
b)
retractable car radio antennae, retractable fishing rods, etc.
c) radiators of ultrasound welders

08) ANTI-WEIGHT

a) wind power plant (moment of inertia in set of smoothing gusts of wind)
b) anti-airscrews
c) fish bladder (fish submerged in water)
d) baloon filled with hot air
e) slipping hydrofoils' boats
f) concept of hoover crafts
g) fishing floats, floating beacons, etc.

09) PRE-ELIMINARY ACTION

a)
surrounding sounds
surrounding sounds
counter-acting acoustic waves
active earphones
b)
piezoelectric anti-impact set for the tool

10) PRE-ELIMINARY ACTION

a)
b) parking of hard disc reading/writing heads
OFF (parking mode)
ON (operational mode)
blowing of the nozzles in printing catridges

11) BEFOREHAND CUSHIONING

a) for instance: a method of "dressing" of the cut tree branches (this action, actually forces a tree to beforehand reaction, to gather healing substances)
a pressure band
b) driver's airbag
c) masking of the chosen elements, within patches on the object, before its painting

12) EQUIPOTENTIALITY

a) a sequence of linear movements is replaced by single seamless movement on section of arc
a heavy element of the press, lifted up, and carried away usually in sequence of linear movements is replaced with press deflected on remotely fasten long arm
a sequence of linear movements
a press deflected from position on long arm
b) dissolvable surgeon threads
c) rather to cool down stuck inner object, than to heat up other bigger outer object, which seizes the former one

13) INVERSION (UPSIDE DOWN)

a) for instance: reversing working mode of vacuum cleaner (then, vapour could be used in cleaning of carpets)
b) to turn mounted object upside down, on assembling line
c) turning (object in move, while motionless turning tool), against milling (mobile milling cutter)
d) binary tree's structure sought from root to leaves in one in-depth search algorithms, while tree sought from leaves to root in another

14) SPHEROIDALITY, CURVATURES

a) applications of:
b) replacement of linear movements by circular movements
bearing rollers, spirals, shafts, spheres, demi-domes
c) application of arcs in architecture demi-domes in vaults of building
d) circular accelators (synchrotrons / magnetrons) in place of concept of linear accelators of particles
e) extensible, retractable measuring tape

15) DYNAMICS

a) automatically extensible/opened doors, air-locks ,etc., reacting while in need
b) automatic gears in mobiles
c) undercarriages in cars of variable stiffness characteristics, tuned exactly to terrain conditions during the driving
d) fully electronically controlled operational mode of carburettor, electronically controlled fuel injection in depedency of driving conditions

16) EXCESSIVE (OR PARTIAL) ACTION

a) in close fit of both piston and cylinder of the engine
material allowance left in fit on inner side of cylinder destined for lapping
b) to spray excessively paint, and then to remove the excess of the paint
c) to fulfill the fuel tank, and then to remove the excess of fuel

17) ANOTHER DIMENSION

a) a two tools colliding in 1D should be rearranged within 2D plane, likewisely tools colliding on 2D plane, should be rearranged in 3D space
b) to stack vertically containers, chairs, laptops, etc.
c) science of complex symmetries in crystalography
d) use of Lie algebra, in analysis of structures of atoms (in studying of electron shells, around atomic nuclei)

18) MECHANICAL SELF-INDUCED VIBRATIONS, IN RESONANCE

a) piezoelectric engine - conceptual design
direction of relative movement of upper disc
direction of aerial wave & relative movement in lower disc
electric circuit of inducement
spring based tightments for set of two discs
both sided metal plating of layer ceramic material fasten to lower disc
b) quartz generators, in electric circuits

19) PERIODICAL ACTION, OR PULSED ACTION

a) hammer drill
e) pulse amplifiers
b) pulsed laser, against lasers of continous operational mode
c) "pseudo-analogue" driving (PWM) (Pulse Width Modulation)
d) pulse DC power unit against conventional DC power unit
f) step motors

20) CONTINUITY ACTION OF USEFUL ACTION

a) enlarging drill, operating in both directions
b) nozzles of catridge, printing also in returning direction (without idle mode)
c) steam turbines of generators for one power plants, working continuously (in optimal mode), while the others working, as pump-storage power plants, in aim of storing of energy for afternoon hours
(mode: pumping of the waters into upper reservoir on mornings, while emptying upper reservoir into lower one on afternoons)

21) SKIPPING, QUICK MODE, OR PACE OF REALIZATION

a) wood-borne materials in quick thermal processing
temperature close to point of ignition
quick thermal processing, while preserving properties of the material
b) laser treatments of biological tissues or in processing of hardly processed materials (both extremely soft and extremely hard) without thermal deformations, scorching, burnings
c) pico-second pulsed lasers (femto-second lasers) against laser of micro- and nano-seconds pulses (various materials virtually have been vapoured, while treated with pico-second pulsed laser beam of energy)
d) steel hardening process in abrupt temperatures changes

22) "BLESSING IN A DISGUISE" (CONVERT HARM INTO BENEFIT)

a) burning out the main fire in outskirts of the main fire, to cut of fire's fiuel
b) to blow out the blazing fire from top of oil well in detonation blast
liquid nitrogen (N_2)
c) permafrost materials are to be "treated" with liquid nitrogen
the material permafrost rapidly "liquefies"

23) FEEDBACK PRINCIPLE

input signal
object
output signal (indoor's temperature regulation)
closed feedback loop of negative feedback
(temperature)
a) basically, as well as particularly:
b) autopilot provided with 3-axis gyro system
c) robot arms movement's back-controlled in set of: 1) diode - 2) photodiode -3) semi-transparent either: protractor, or: linear scale - placed in between

24) INTERMEDIATE MEANS, "FITTING" PRINCIPLE

a) in electronic circuits fitting either of:
- impendance,
- or resistance,
of input source to the receiver
(Zinput) (Input impedance)
(Zreceiv.) (receiver's impedance)
fitting of input impedance to receiver's impedance
b) fitting in mean of:
- pressure-flowing (fluid mechanics),
- loading of force moments,
in transmition gears (mechanical fitting)
- stress of two interfacing surfaces (endurance)

25) SELF-SERVICING PRINCIPLE

a)
b)
self-servicing lines deicing system
temp <0°C
temp >0°C
constant regeneration of the glower of halogen lamp
tungsten sublimates to halogens then, to redeposit on tungsten glower

26) COPYING, IMAGING RULE (application of optical mapping)

a) use of ultrasounds
ultrasound mapping
b) magnetic resonance mapping
c) X-rays radiography
d) application in mapping of material structures of:
- infrared
- ultraviolet
- basically of optical methods
e) use of fluorescence and of scintilation's materials

27) INEXPENSIVE SHORT-LIVED OBJECTS (CHEAP CADUCITY, & OF DISPOSABLE MATERIALS)

a) kitchen utensils, dishes, cutlery made of plastic
b) disposable syringes, gloves, etc.
c) plastic bags, packaging wrappers, etc.
d) printing head integrated with ink catridge
(formerly, each printer possessed built-in printing head)
(presently, each of ink catridge has its own printing head)

28A) PRINCIPLE OF SUBSTITUTING OF MECHANICAL SYSTEM WITH FUNCTIONALLY EQUIVALENT ELECTRO-MAGNETIC SYSTEMS

electric field
to substitute
with interaction of:
magnetic field
mechanical pressure or fastening

28B) SUBSTITUTING OF MECH. SYS. WITH ELECTRO-MAGN. SYSTEMS

B) magnetic borne pressure of the machined materials
object's pressure
pneumatico-magnetic pressure cushion
C) mobile fields instead of static fields
D) heterogenous fields

29A) PNEUMATICS & HYDRAULICS

- pneumatic automobile tyre,
- pneumatics (air-tight) dampers,
- automobile airbags,
- pneumatic "discrete", driving of operational actuators for instance: automatic welding of wrapping plastic packing films
on the figure above, in blue: approximate section of automobile pneumatic tyre

29B) PNEUMATICS & HYDRAULICS

- automobile brakes,
- in driving of plane elevator,
- where the precision of driving is needed, as well as enormous force transition
$F_2 >> F_1$
brake's block
hydraulics in communicating vessels
$S_2 / S_1 = F_2 / F_1$

30) FLEXIBLE FILMS AND FOILS, MEMBRANES

a)
not wettable film prohibits evaporation of water
b)
wrapping packaging based on plastic, air-pumped bubbles

31) POROUS MATERIALS

a) aerated concrete
b) porous abrasive tools
g) porous steam cookers getters
c) polyurethane foam
d) catalysing surfaces in chemistry
e) "vacuum" as a "construction building material"
f) openwork structures reinforcements

32) COLOUR CHANGING (ALTERNATING)

in lapping process for inner surfaces of engine pistons & cylinders, the probing of phoshorescence distribution can be used

33) HOMOGENEITY

the two interfacing surfaces should be made of the same material
moreover, the similarities can be applied, regarding:
- comparable mat.'s hardness, chemical inertion, structures,
- comparable thermal expansion's coefficients, (in case of dental materials: metal-glass conjunctions),
- comparable electro-chemical potentials (in avoiding electro-chemical borne corrosion)
- same fatigue characteristics, and amortization specifics

34) DISCARDING, RECOVERING, PARTS REGENERATION

a)
soluable medication capsules made of (biologically inert material)
b)
IV stage
III stage
II stage
I stage
rocket's stages subsequently discarded during the flight
c)
cornstarch-based packages for dry products

35) CHANGING STATE, PARAMETERS, PROPERTIES OF MATERIALS

1) high temperature food processing
2) low-temperature food preserving
3) a product ready for further processing step (for submerging in liquid chocolate)
temp >>0°C
temp < 0 °C
0°C

36) PHASE TRANSITION

a binary, phase transition cycle for refridgerator construction
temp <0 °C
temp >0 °C
heat flows from surroundings (red arrows directed to blue heat exchanger)
necking
compressor
liquefied ammonia, heat carrier, (freon, ammonia, etc.)
circulation of liquefied ammonia in heat exchanger

37) THERMAL EXPANSION

1) thermal shaft fitting
temp > 0°C
temp < 0°C
2) state of thermal ballance

38) STRONG OXIDANTS

a) oxygen O_2
b) ozone O_3
c) (indirectly vapour) H_2O
in oxidation of metal's surface (iron with over-heated vapour under pressure, at 300°C degree)
O_2
O_3
the surface with protection layer obtained due to oxydation

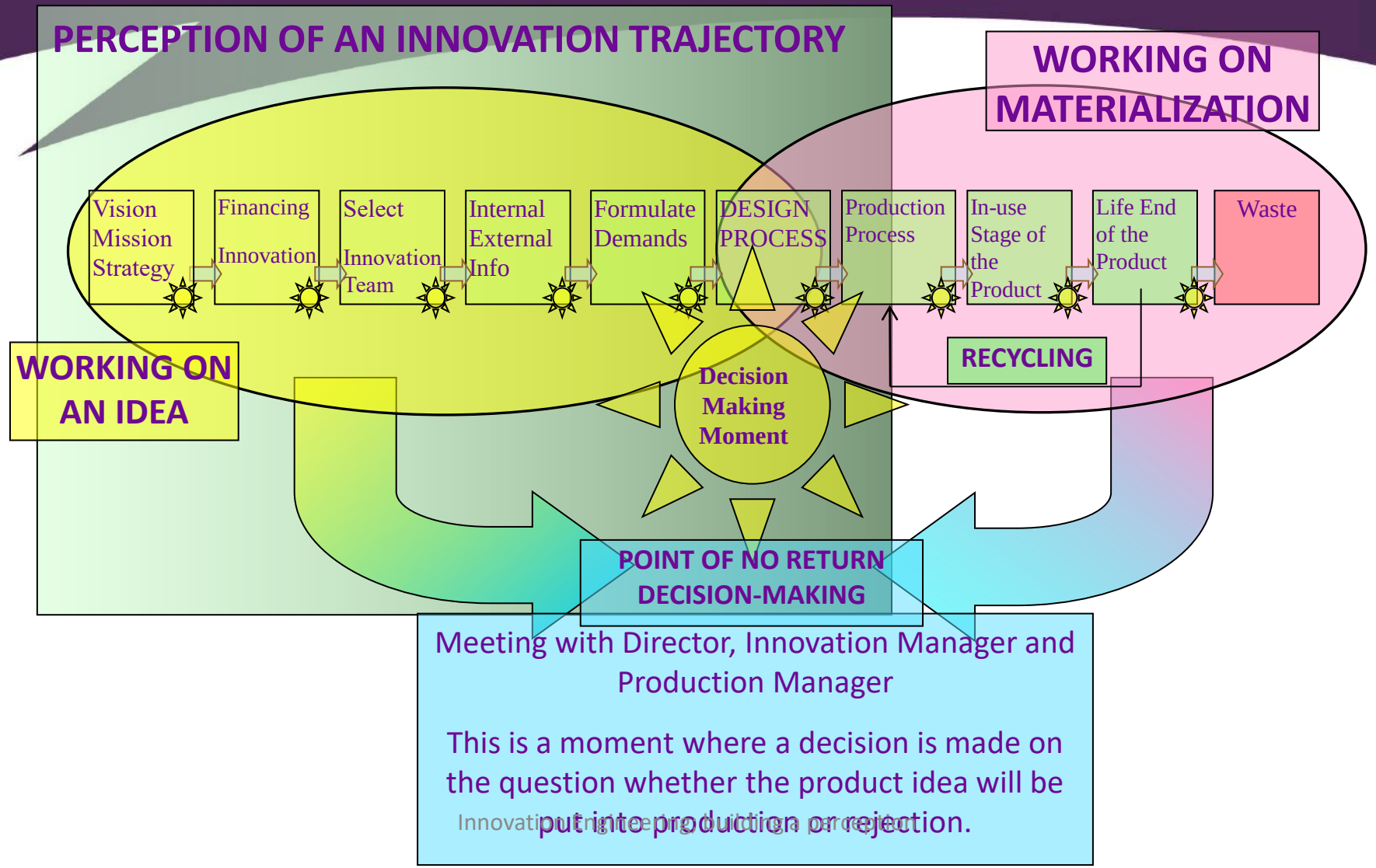
39) NEUTRAL ATMOSPHERES, INERT ENVIRONMENTS

a) C_{02} extinguishers
b) N_2 or He_2 proctection atmospheres in processing, and production
c) N_2 or He_2 protection atmospheres in storing of products, and materials, both raw and processed

40) COMPOSITE MATERIALS

1) elements of blades, rotors, airscrews in wind turbines constructions;
2) yacht's & cataraman's constructions;
3) elements exposed to ultra-strong, severe stress
m/s

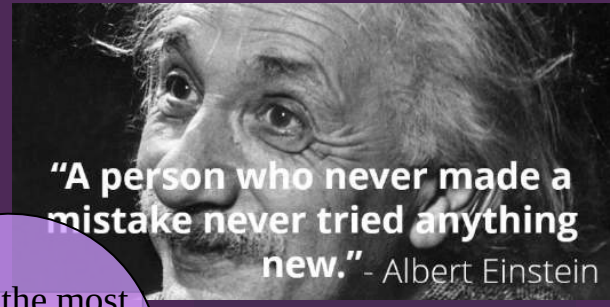
What can be seen as innovation process?



Meeting with Director, Innovation Manager and Production Manager

This is a moment where a decision is made on the question whether the product idea will be put into production or rejection.

Decision-making at different levels



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PERCEPTION OF AN INNOVATION TRAJECTORY

WORKING ON MATERIALIZATION

Do we have the right Competences on board?

What is Relevant information?

What should be the goal on market With the obtained product?

Is the proof of concept interesting to be designed into a full final product?

What's the most convenient way to produce the innovation?

Are we satisfied about the satisfaction of the user?

Vision Mission Strategy

Financing Innovation

Select Innovation Team

Internal External Info

Formulate Demands

DESIGN PROCESS

Production Process

In-use Stage of the Product

Life End of the Product

Waste

WORKING ON AN IDEA

RECYCLING

Decision Making Moment

Should we taking the initiative in order to invest in innovation development

What are the possible financial means for a innovation research?

How can we foresee the life end of our product? Shall we invest in sustainability?

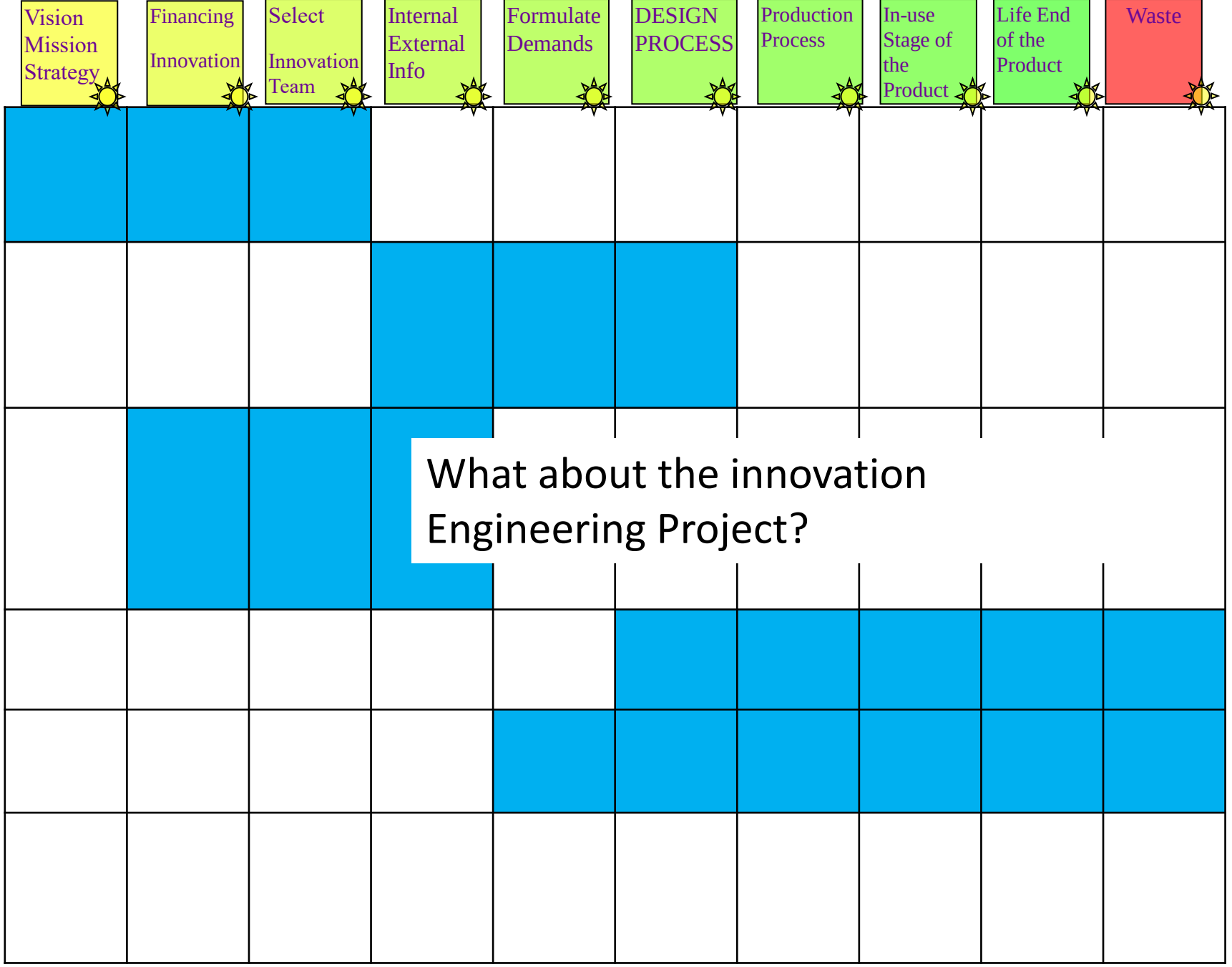
POINT OF NO RETURN DECISION-MAKING

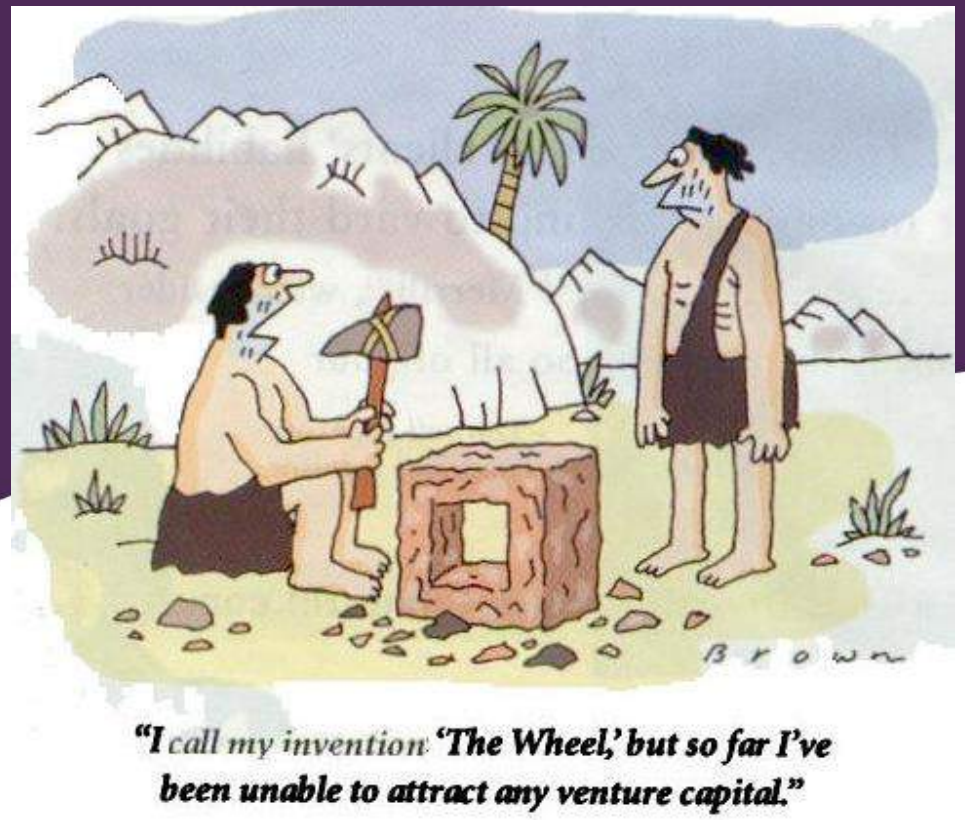
Meeting with Director, Innovation Manager and Production Manager

This is a moment where a decision is taken on the question whether the product idea will be put into production or rejection.

Finally: Shall we take the risk?

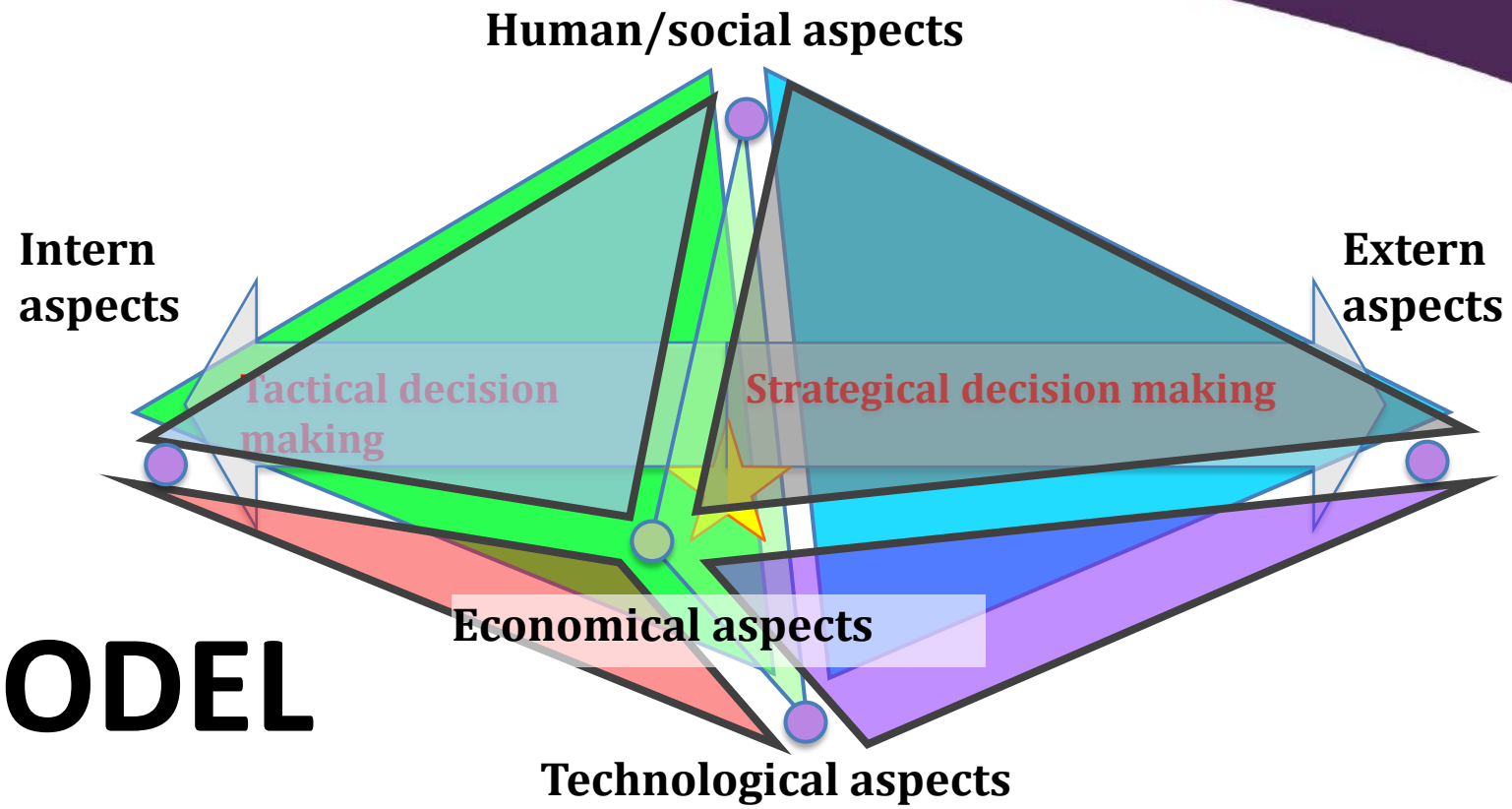
Phases	Description of activities
Start-up activities	Introduction of team members
	Setting up interdisciplinary collaboration.
	Search cultural difference of partner Universities.
	Discuss communication procedures
	Get in contact to Business students
	Ending Milestone 1 (Week 37)
Creative Process	Search for interesting ideas. Using creativity methods
	Analysis of customer's needs, defining a possible market.
	Writing technical, product-related and market-related demands/requirements/conditions
	Literature research to investigate latest information idea(s)
	Patent search and having contact patent expert
	A pitch
	Ending Milestone 2 (Week 41)
Organizing Project	**Trip to collaborating international University. Decision which concept will be developed.**
	Discussing how to set up Project Management plan
	Writing a complete plan of approach/project plan
	Finding interested company and possibly sponsoring
	Ending Milestone 3 (Week 41)
	Search for possibilities on sustainable development
	Search for possibilities in IPR
	Finding new trend connected to the idea
	Ending Milestone 4 (Week 4)
Design	Design the mechanical/Mechatronical/electrical system
	Make calculations to power, forces, etc
	Making technical drawings, electrical schemes, etc.
	Preparing making the proof of concept
	Ending Milestone 5 (Week 49)
Investigate Business	Researching market possibilities
	Investigate business requirements
	Investigate information for business plan
	Organize the production of the proof of concept.
	Ending Milestone 6 (Week 2)
Finishing	Make a video film Youtube of your I^2E^2 project (about 10 min).
	Prepare presentation for symposium.
	Make a poster for presenting to I^2E^2.
	Write final I^2E^2 Report
	Write final Business Innovation Report
	Ending Milestone 7 (Week 3)
	Visiting collaborating international I^2E^2 symposium Strasbourg. (Wk 2-6)





"I call my invention 'The Wheel,' but so far I've been unable to attract any venture capital."

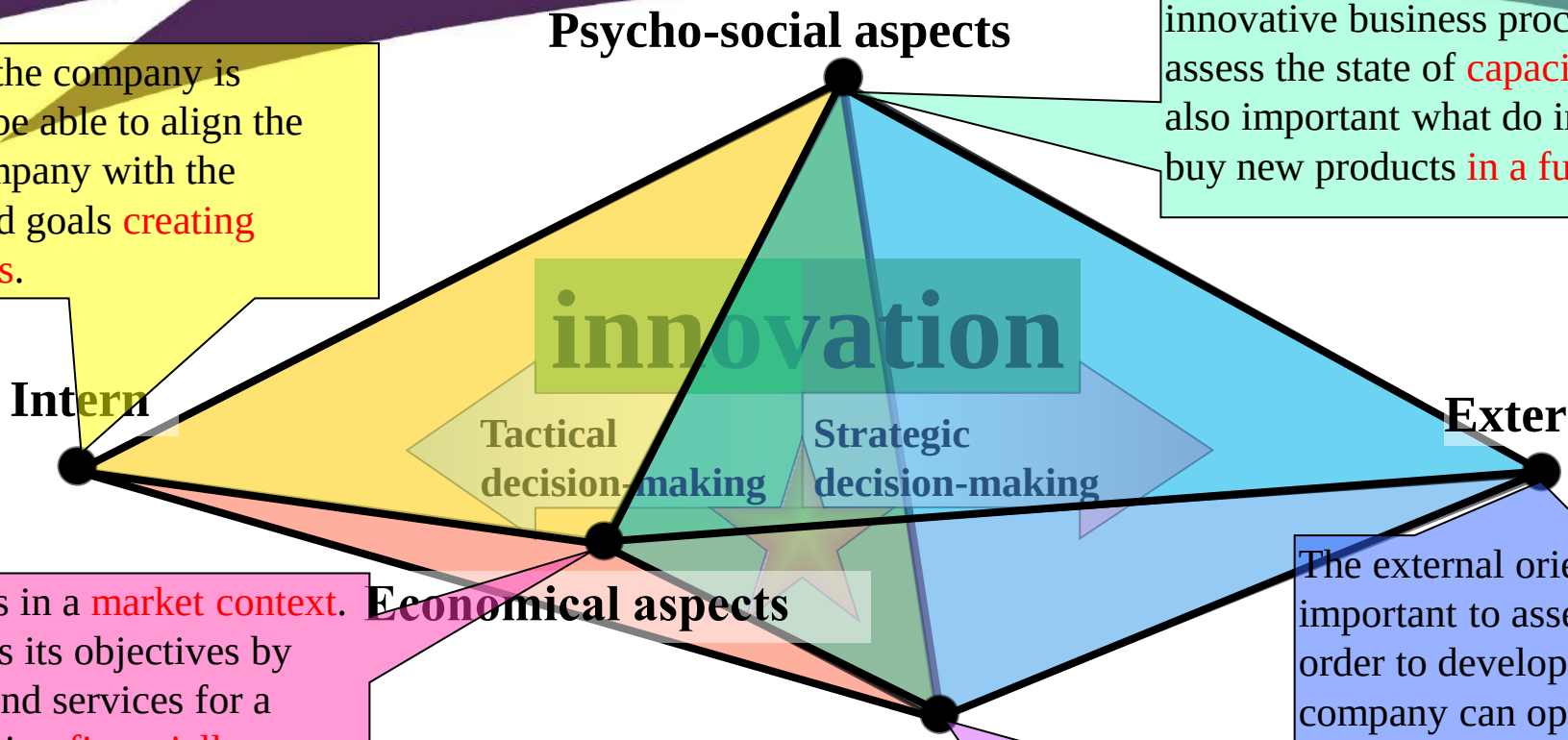
What is a valid set of Innovation criteria to be used in a innovation development research?



DIAMOND MODEL

Holistic 3D model criteria for innovation development research.

What is a valid set of Innovation criteria?



The internal focus of the company is important in order to be able to align the capabilities of the company with the business processes and goals creating products for customers.

The importance of a psycho-socio vision of an innovative business process, where it is to assess the state of capacities of the staff . It is also important what do interest customer to buy new products in a future market.

The company operates in a market context. The company achieves its objectives by developing products and services for a market and thereby being financially resourced to achieve the business goals.

The external orientation of the company is important to assess future situations in order to develop a strategy with which the company can operate lucratively in the future

The technological competences of the employees in form of 'tacit' knowledge and explicit knowledge gives the company opportunities to develop products. Companies always need to know what is the new developed technology that could be part of innovative product development.

DIAMOND MODEL

International literature

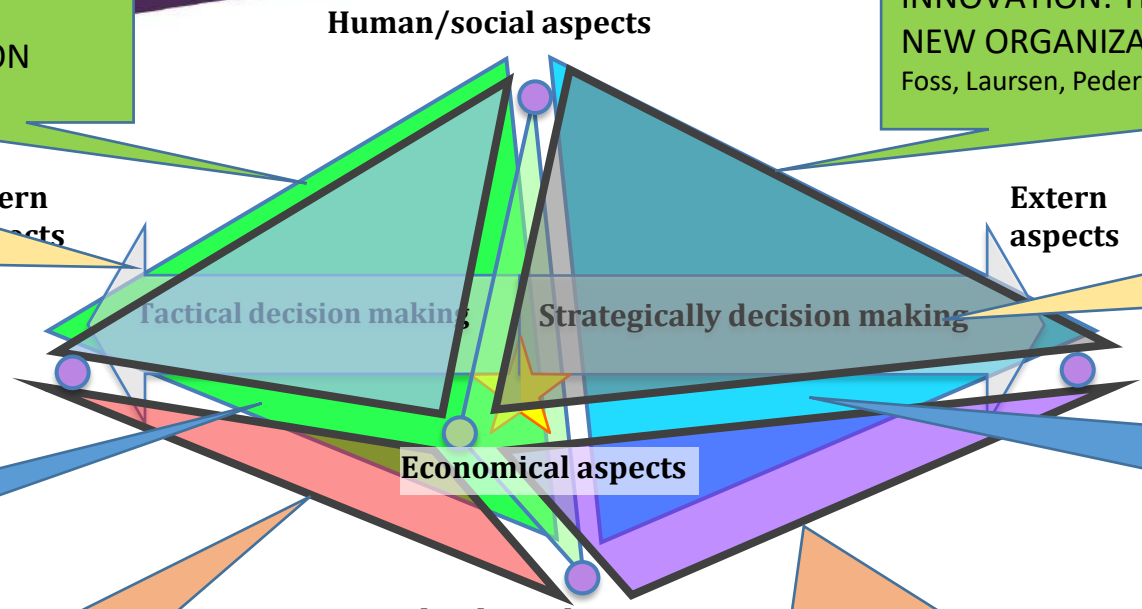
Fontys University of Applied Sciences

PSYCHO-SOCIAL FACTORS THAT PROMOTE ORGANIZATIONAL SUSTAINABILITY AND INNOVATION
Zenobia Niculiță

LINKING CUSTOMER INTERACTION AND INNOVATION: THE MEDIATING ROLE OF NEW ORGANIZATIONAL PRACTICES
Foss, Laursen, Pedersen

INNOVATION AND DECISION MAKING: UNDERSTANDING SELECTION AND PRIORITIZATION OF DEVELOPMENT PROJECTS.
Gutiérrez, Sandström, Janhager, Ritzén

DEVELOPING A PRODUCT INNOVATION AND TECHNOLOGY STRATEGY FOR YOUR BUSINESS
Cooper and Edgett



THE IMPACT OF FINANCIAL MANAGEMENT ON INNOVATION
Illmeyer, Grosch, Kittler, Priess

IMPACT OF PRODUCT DEVELOPMENT AND INNOVATION ON MARKET SHARE
Chux

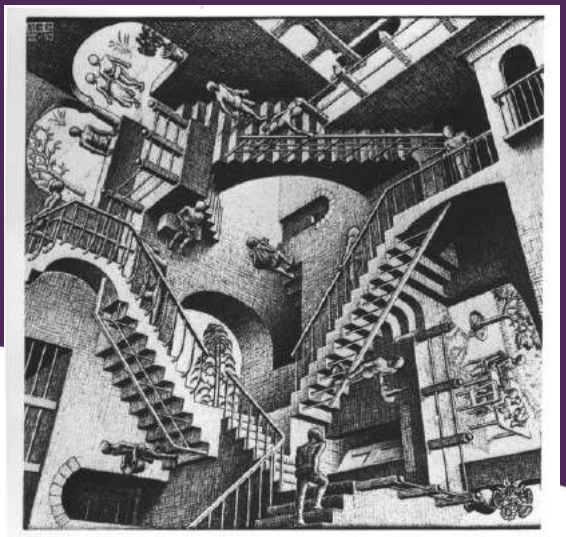
INNOVATIONS WITHIN KNOWLEDGE MANAGEMENT!
Nowacki and Bachnik

IDENTIFYING FIRST SIGNALS OF EMERGING DOMINANCE IN A TECHNOLOGICAL INNOVATION SYSTEM: A NOVEL APPROACH BASED ON PATENTS
Berg, Wustmans, Bröring

Stakeholders as a starting point for innovation development

Stakeholders	Characteristics for strategic decision-making	Triggers for innovation development
Consumers:	Follow what's going on in the market.	Continuous innovation to meet the renewed requirements of customer.
Industrial customers:	Strategy of developments to understand customer companies' needs. Know their goals and targets.	Innovation consists of being able to solve the problems of possible industrial clients.
Shareholders	Interests of shareholders need to be ensured.	If a company is innovative, then it can attract shareholders. They deliver financial means to invest in innovation.
Competitors:	Benchmark company's position on market.	Innovation means staying ahead of the competition.
NGOs:	Voice of society. They can give the company a negative or a positive image.	NGOs want innovative products being save, sustainable, eco-friendly, etc. They're a voice of society.
Advisory institutes:	Investigate what are the missing information needed for success.	If companies do not have their own capacity for developing innovation, consultancies can help e.g. Patent office and Engineering consultancies.
Government:	Check whether the new product to innovate needs to meet the Governmental standards.	Governmental standards, innovation need to satisfy to. Government grants for innovative projects.
Employees:	Does our existing staff need extra training or should we attract new staff	Do employees have proper competences to be able to develop innovation?

Advice to become an innovator



Have an open mind to see things differently, is important. Think out of your comfort box.
M.C. Esher

- Be good in your engineering profession!!!!!!!
- Be interested in what is going on inside and outside the company.
- Know the needs of company's costumers
- Be interested in the activities of competitors
- Build your own vision of what is important for the company to invest in
- Have information who in the company has key positions and key knowledge to participate in initiatives on innovation development
- Go to international conferences and symposia to notice newest developments
- Get attention of management to your innovation perceptions

Responsibility of engineers

To take initiative to analyse possibilities for innovation development in a company and persuade the tactical management to invest in this ‘adventure’.

Questions?

A online meeting will be organized for you to ask questions to the teacher to be answered