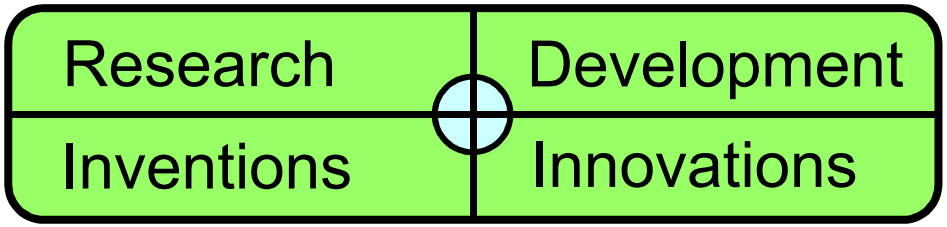
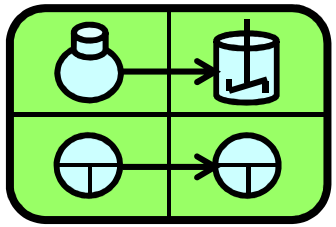




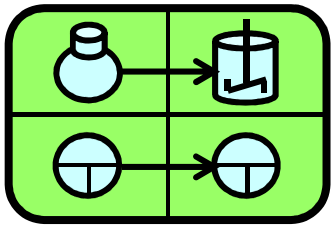
R&D Project Management in the Chemical Industry

Dr. rer. nat. Rainer Buerstinghaus, Telgte (D).

PDF Files for University Lectures.

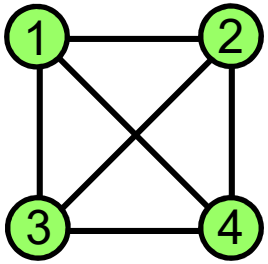
Research | Development

Inventions | Innovations



For students (m/f/d) of natural sciences, who want to think, plan and act within the "(K_4)-System" and its vertices:

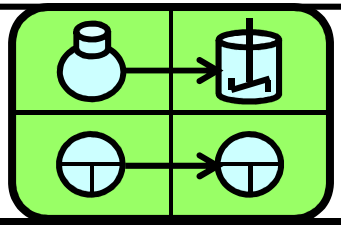
(1) Experiment, (2) Discovery,
(3) Invention and (4) Innovation.



(K_4): $\begin{bmatrix} 4 \\ 2 \end{bmatrix}$

Effective R&D project management takes the chances in (K4)!

R&D Project Management in the Chemical Industry

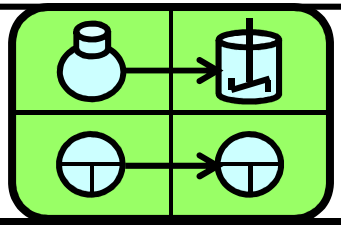


The content is summarized in several lecture modules, which were explained at the following three universities:

Rupprecht-Karls-Universität Heidelberg	Westfälische Wilhelms-Universität Münster	Universität Zürich (UZH)

University of Heidelberg	1999-2015
University of Münster	2010-2018
University of Zürich	2007-2021
Also: GDCh Advanced Training, Frankfurt/Münster	2005-2020

R&D Project Management in the Chemical Industry



The following collection of PowerPoint® Charts is intended to further clarify and supplement the relevant specialist publications on the subject matters dealt with. This collection in no way is used for any commercial purposes, but as learning material for students.

Selected sources for in-depth studies of the respective subject matters are given in some lists of references.

The chemical-technical target components, formulas, deadlines, data, project structures and action plans shown in project examples P1-P3 are widely with a practical orientation, but yet purely fictitious. They are solely used for a clear illustration of the particular topic and for learning purposes.

The names of all persons with project functions are solely fictional. Matches with the names of other people would be purely coincidental.

Rainer Buerstinghaus

Job advertisements for the staffing of Project Team Positions in R&D have been published recently, e.g. by the following employers:

Beiersdorf AG	TAROS Chemicals GmbH	Roche Holding AG	BASF SE
Novaled GmbH	Hilti Corporation	Merck KGaA	The Dow Chemical Company
Wacker Chemie AG	Ems-Chemie Holding AG	Evonik Industries AG	Carl Zeiss AG
Fraunhofer-Gesellschaft	Max-Planck-Gesellschaft	Karlsruhe Institute of Technology	Bayer Aktiengesellschaft

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Excerpts from job advertisements for project-related positions published during 2020/2021 in the following German Media →

Print Media including Online Issues	Pure Internet Portals
Süddeutsche Zeitung	www//stepstone.com
Frankfurter Allgemeine	www//careerjet.com
DIE ZEIT	www//jobvector.com
Handelsblatt	www//linkedin.com
Nachrichten aus der Chemie (GDCh)	www//audimax.de
Chemie in unserer Zeit	www//academics.de
Chemie Ingenieur Technik	www//scitec-career.com
VDI-Nachrichten	www//monster.com
Angewandte Chemie International Edition	www//chemiekarriere.net

Excerpts from job advertisements published in 2020/2021 (Germany)

JOB DESCRIPTIONS:
"**Project Manager** Technology Transfer (m/f/d)"
"Senior Chemist and **Project Manager** (m/f/x)"
„Chemiker, Lebensmittelchemiker als **Projektleiter** (m/w/d)“
"**Project Manager** (m/f/d) Process Development"
„Chemiker*in als **Projektleiter*in** F & E“
„Promovierter Chemiker (m/w/d) als Technischen **Projektleiter**“
"**Project Manager** (m/f/d) R&D"
„**Leiter (m/w/d) Großprojekte** Chemie- und verfahrenstechnische Anlagen“
"**Project Manager** & Research Associate (m/f/x)"
"**Project Manager** (m/f/d) Quality Management with Focus on Biotechnology"
"Chemist / **Project Leader** (m/f/d) Industrialization"
„Promovierter Chemiker/Biochemiker (m/w/d) als **Fachprojektleiter** Analytik“
"Scientific **Project Manager** (m/f/d)"

Rainer Buerstinghaus

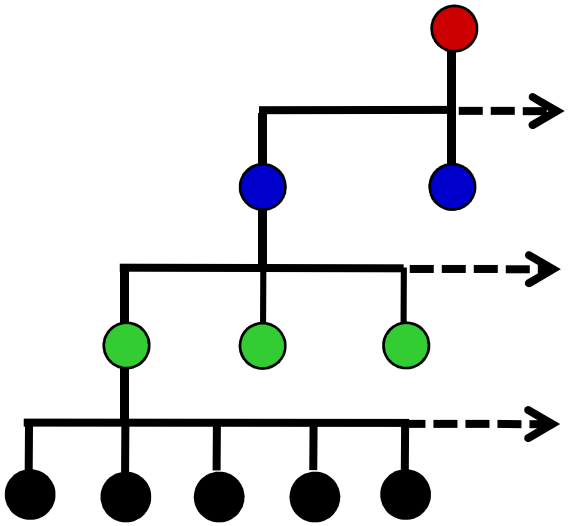
Excerpts from job advertisements published in 2020/2021 (Germany)

TASK AREAS (EXCERPTS):
„Technische Leitung, Entwicklung und Bewertung von umfangreichen und komplexen **Projekten**… bis zur Produktionsreife mit internen und externen Partnern, …Durchführung der **Projektplanung** und Sicherstellung der Zielerreichung.“
"You will lead **projects** or portions of **projects** and document results for management reviews…"
"You will develop innovative approaches for achieving specific objectives within a **project** framework."
"The **Project Manager** is responsible for developing and executing a detailed **project management** plan for an assigned R&D **project**…"
"…You will coordinate crossfunctional execution of **project**-related work packages… develop timelines, deliverables and budget for the assigned research **project** and track progress…identify project risks and recommend appropriate resolutions…"
„Leitung von komplexen Forschungs- und **Technologieprojekten**, inklusive Freigabeverantwortung, …Präsentation der **Projektmeilensteine** in Steuerungs-meetings und **Projektübergabe**."
"Manage our multi-**project**-management tools and guide local **project** managers."

Excerpts from job advertisements published in 2020/2021 (Germany)

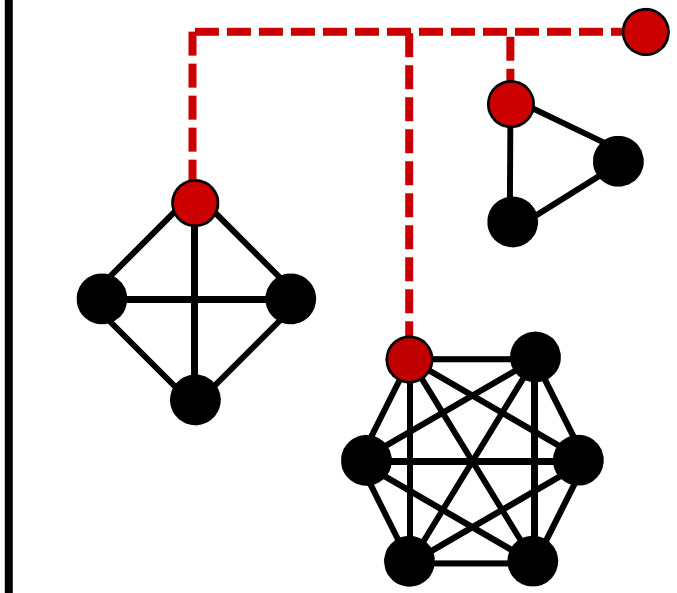
PERSONALITY PROFILE (EXCERPTS):
"Excellent organizational skills including knowledge of **project management** tools…Experience to work in a matrix environment."
"Excellent analytical and problem-solving skills…GxP training and experience highly preferred…Work independently and proactive in R&D **projects**…"
"Ideally at least five years of professional GMP experience in technology transfer, strategic **project management** and product management of a pharmaceutical, radiopharmaceutical or medical technology industry…"
„Gute Fähigkeiten im Bereich **Projektmanagement**, teamorientierte, interdisziplinäre, strukturierte und selbstständige Arbeitsweise.“
"Experience as **project leader** and/or coordinator on international **projects**."
„Sie besitzen fundierte Kenntnisse in der **Projektplanung** und beherrschen die entsprechenden Projektmanagement-Instrumente.“
"Readiness to steer industrialization **projects**."
"Minimum 3 years of **project management** experience in Consumer Products Industry. Willingness to take consumer insights and work with experts from different teams to lead research and development **projects.**"

Innovations by means of "Project-tied Economy"



Frame Conditions "Routine Operation"

- Hierarchical Structures.
- Corporate Governance.
- Line Culture: Integration.

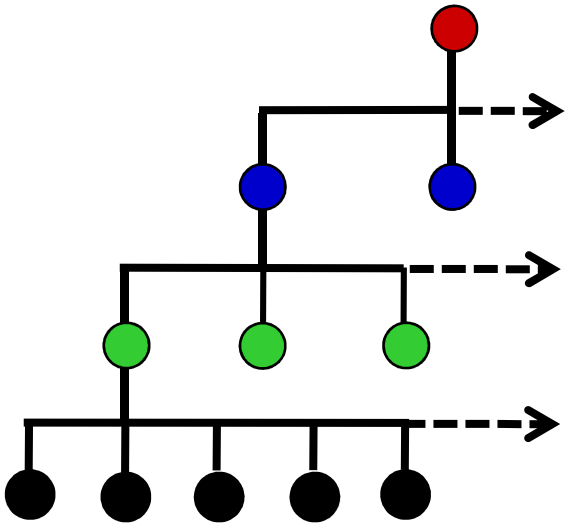


Frame Conditions "Project Operation"

- Full Structures (Simplexes).
- "Project Governance".
- Project Culture: Inclusion.

Rainer Buerstinghaus

Innovations by means of "Project-tied Economy"



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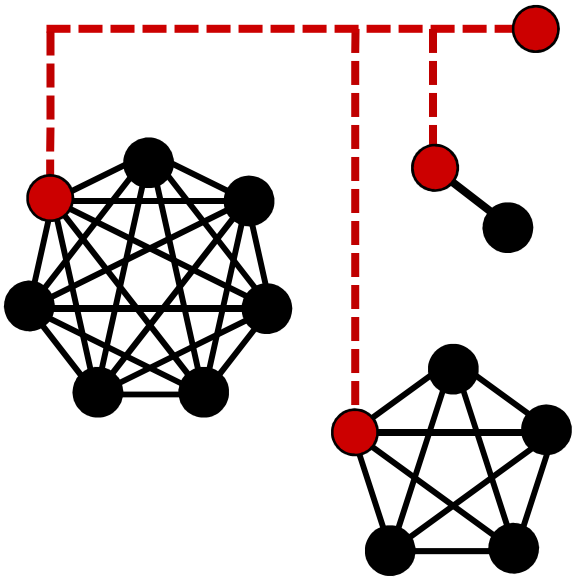

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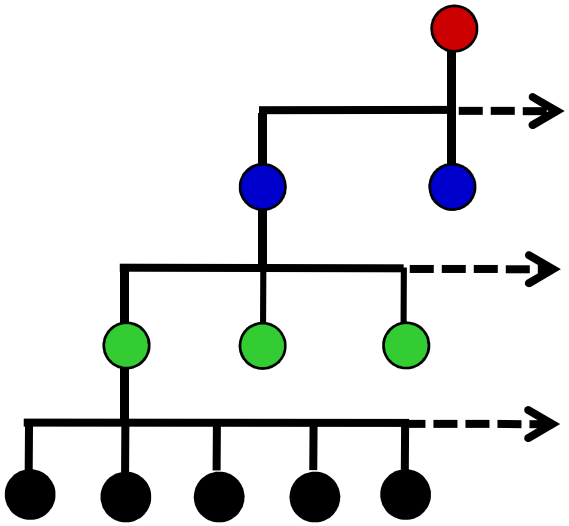

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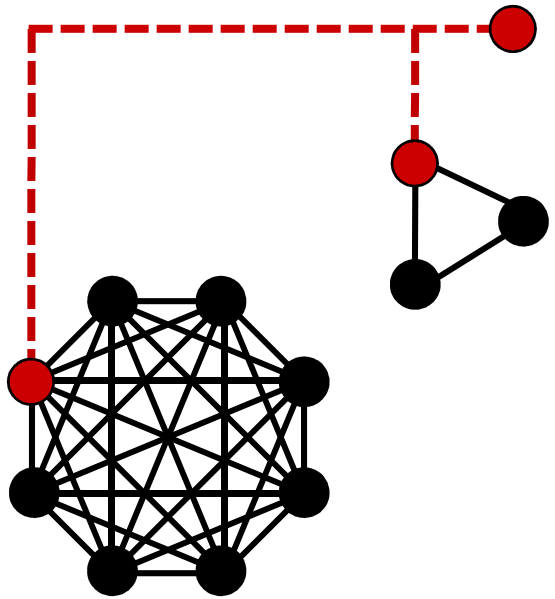

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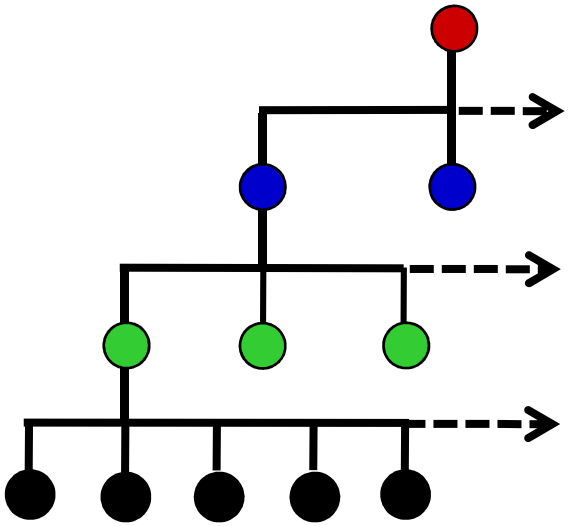

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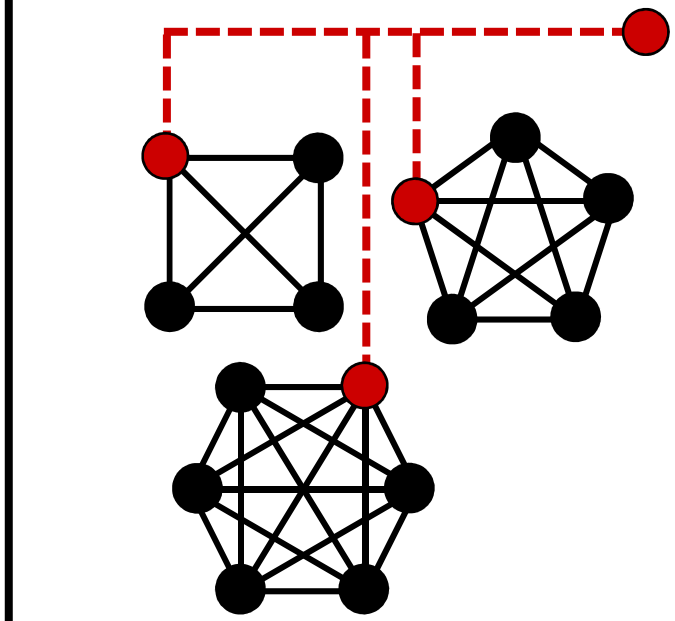

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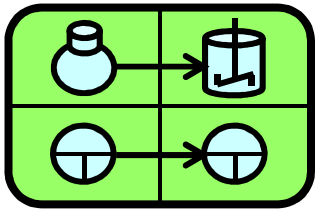
Rainer Buerstinghaus

R&D Project Management
in the Chemical Industry

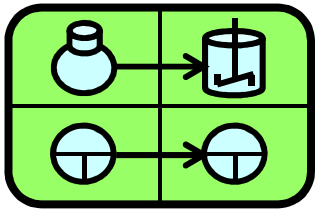


The Subject Matter

- Innovations: Characteristics, Measures for its Promotion, Process Variants.
- Three Examples for Innovation Projects (Chemistry and Technology):
  1. Highly Elastic Clear Coats for the OEM Automotive Sector.
  2. Nitrilase Catalyzed Synthesis of a Chiral Hydroxy-Carboxylic Acid.
  3. New Metal-Organic Frameworks for the Adsorptive Storage of Gases.
- Projects, Target Systems, Project Management in R&D.
- Appropriate Organization and Effective Structure Planning of R&D Projects.
- Project Flow Planning, Milestones, the Stage-Gate®-Process, Network Diagrams.
- Effective Implementation and Control of R&D Projects, Trend Analyses.
- Success Risks: Identification, Classification and Treatment.
- Recruitment and Lead of Project Staff:
  Chemists (m/f/d) – Team Players, Pacemakers and Executives in Projects.
- Project Manager (m/f/d): Tasks, Leadership Functions and Personality Profile.
- The Systematic Evaluation of Individual R&D Projects.
- R&D Strategy: The Planning of a Project Portfolio.

R&D Project Management in the Chemical Industry

The Subject Matter



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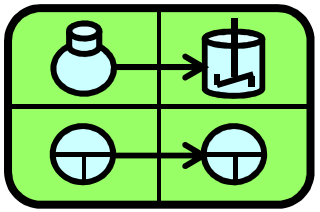
R&D Project Management in the Chemical Industry



Subject Matter →

Innovations: Characteristics.

Public Statements on the Entrepreneurial and National Economic Significance of Innovations:

"The ability to innovate determines our destiny."

(Roman Herzog, **1997**)

"Germany needs a completely different innovation culture!"

(Roland Berger, **2004**)

"Innovations are more important for the company`s success than ever!"

(European Business School, **2010**)

"The ability to innovate clearly determines the success of a company!"

(PwC-Study, **2015**)

"Europe is shaping its future through research and innovation!"

(European Commission, **2020**)

Different Specifications and Meanings of the Term "Innovation" During the Course of Time:

- Renewal, Change (Augustinus of Hippo, 415).

- **Creative Destruction** (J. A. Schumpeter,1910).
- Planning and implementation of new products, new processes, methods, coupled with the development of new markets (According to J. A. Schumpeter, 1911).

Different Specifications and Meanings of the Term "Innovation" During the Course of Time:

- **Enforcement of new combinations** as a dynamic means of companies (J. A. Schumpeter, 1912).

- Result of the innovation process: From the idea to the widespread application (National Science Foundation, U. S. A., since around 1950).
- Successful conversion of knowledge into money (Numerous sources, since around 1990).

Different Meanings of the Term "Innovation" over Time. Today's Definitions in Use:

- The (complex) renewal, accompanied by technical, social and economic change.
- **In the market intensively effective renewal with a high social acceptance**.
- **Invention, which was successfully introduced into the market with a permanent and intense "dynamic of demand"**.

Different Meanings of the Term "Innovation" over Time. Today's Definitions in Use:

- The economic implementation and use of a new problem solution.
- Widespread implementation of new technical, economic, social and organizational problem solutions in companies. They focus on meeting corporate goals in a novel way.

Innovations: Characteristics

Materially and Immaterially Oriented Innovations:

Widely spread realization of a novel and progressive problem solution in one or more of the following four domains:

▪ Product ▪ Production process	***material***
▪ Service ▪ Organization	***immaterial***

Innovations: Characteristics

Basic Types in the Chemical Industry:

Types of Innovation	Objectives
▪ Product innovations ▪ Service innovations	**Development of New Markets**
▪ Process innovations ▪ Organizational innovations	**Increase in the Efficiency**

Rainer Buerstinghaus

Innovations: Characteristics

Innovation: The Widely Realized Novelty.

Latin: innovare – renew

Innovations

Methods	Results	Benefit
(R&D) Projects for the professional transfor-mation of inventions into market successes.	Achieved Goals.	Demand Dynamics.
	Improved Products.	Earnings.
	Improved Procedures.	Positive Cashflows.
	Given Approvals.	(New) Jobs.
	New Market Accesses.	Effective "Image Boost".

Innovations: Characteristics

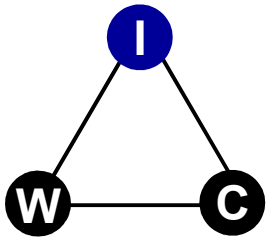
Impact of Innovations on (Chemical) Companies:

Josef Alois Schumpeter 08.02.1883-08.01.1950

1919: Finance Minister of Austria.

1932: Professor at Harvard University.

I	**Innovations**
W	Workplaces
C	Capital



(K_3): Complete Graph:
Three vertices, three edges.

(K_3): $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$

Joseph Alois Schumpeter (Economist)

"Researchers and Entrepreneurs need both: Creativity and Implementation Power! They are Creative Destructors!"

Innovations: Characteristics

Individual Features:

- Novelty, in contrast to the hitherto existing.
- Clearly discernible (technical) improvements.
- Inventions mostly provide their basis.
- Laborious, complex processes of emergence are typical.
- Visible or latent risks during the generation.
- "Maturity" is often necessary for "acceptance".
- "Suitable" points in time for market launch are required.
- Demonstrable advantages for the customers / users.
- Economic success for the "innovators".
- Decisions on the overall success (+/−): → Market.

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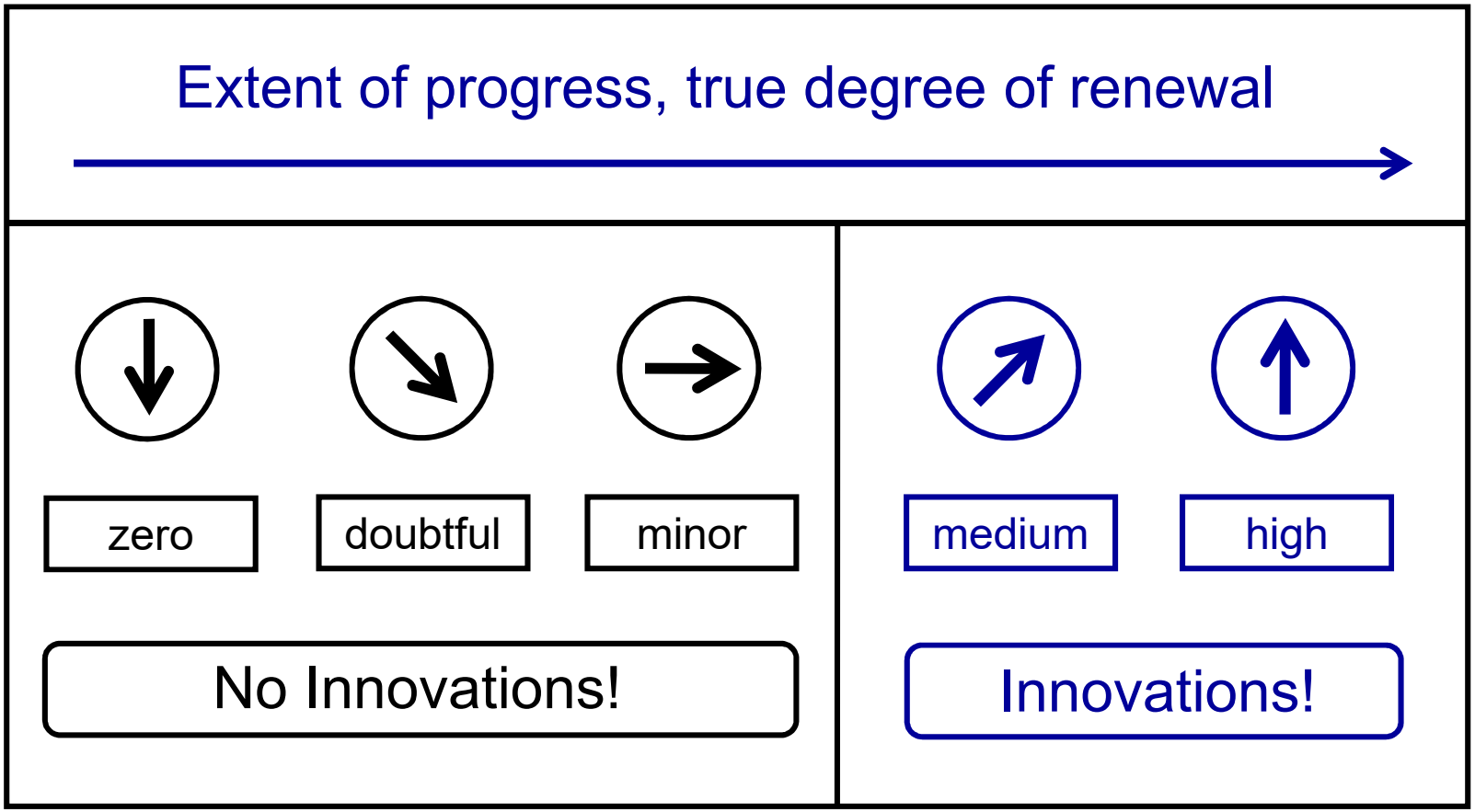
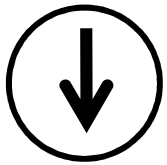
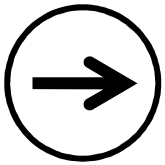
Innovations: Characteristics

Innovations: Clearly Discernible (Technical) Progress.



Innovations: Characteristics

Extent of Progress, True Degree of Renewal:

▪ Imitations	▪ Ostensible Novelties	▪ Adjustments
Application of already existing solutions from other companies.	Pseudoimprove-ments with no real benefit for the customers.	Adaptation of existing solutions to specific customer requirements.
 zero	 doubtful	 minor

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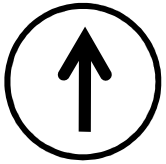
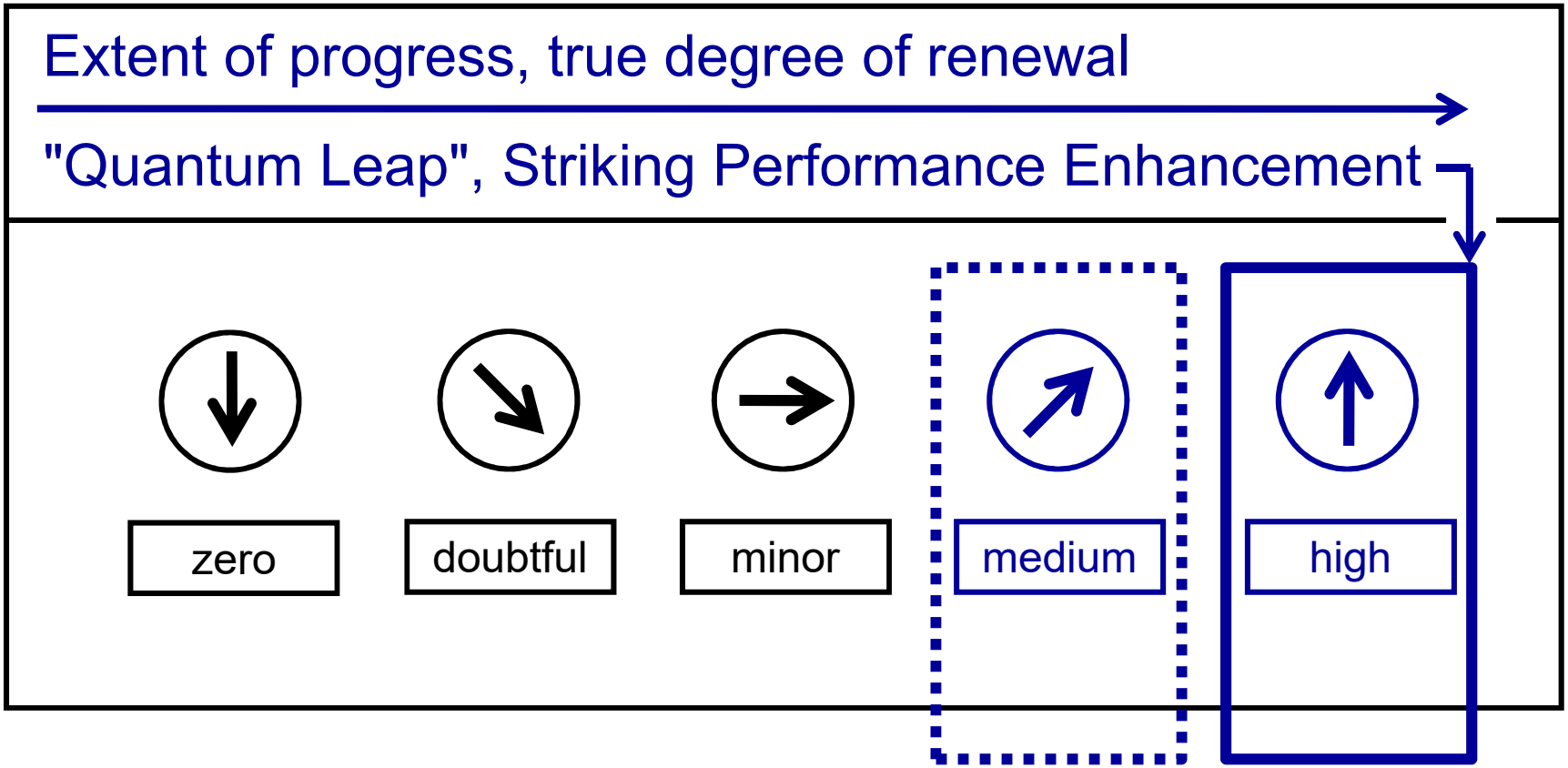
Innovations: Characteristics

Extent of Progress, True Degree of Renewal:

▪ Improvements	▪ "Disruptive" Innovations
Clearly noticeable improvement(s) of one or more quality parameters for a product, procedure or a service.	Introduction of new key- and pacemaker technologies and/ or new organizational principles. Completely new products, procedures and/or services.
 medium	 high

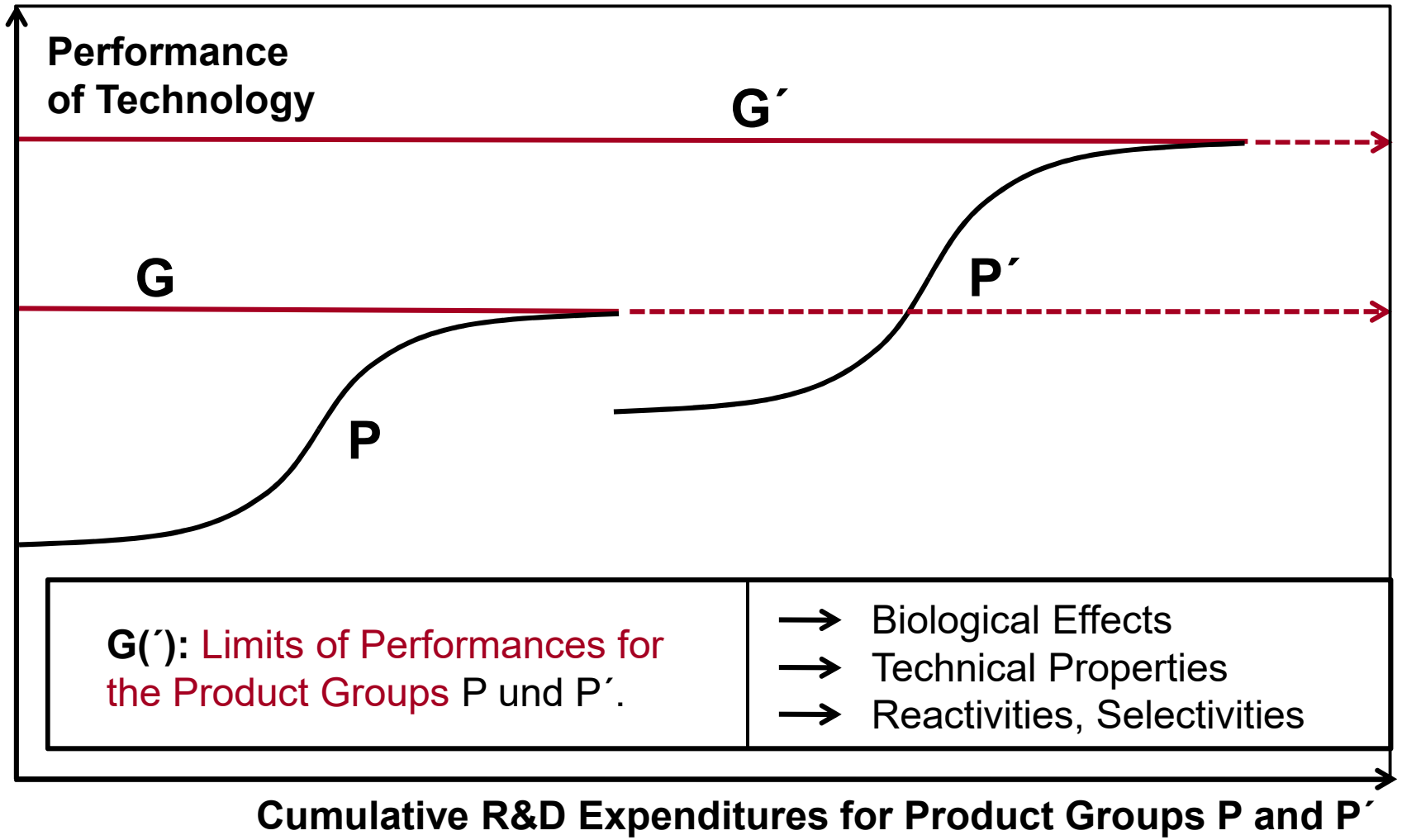
Innovations: Characteristics

Innovations, (Technical) Progress:



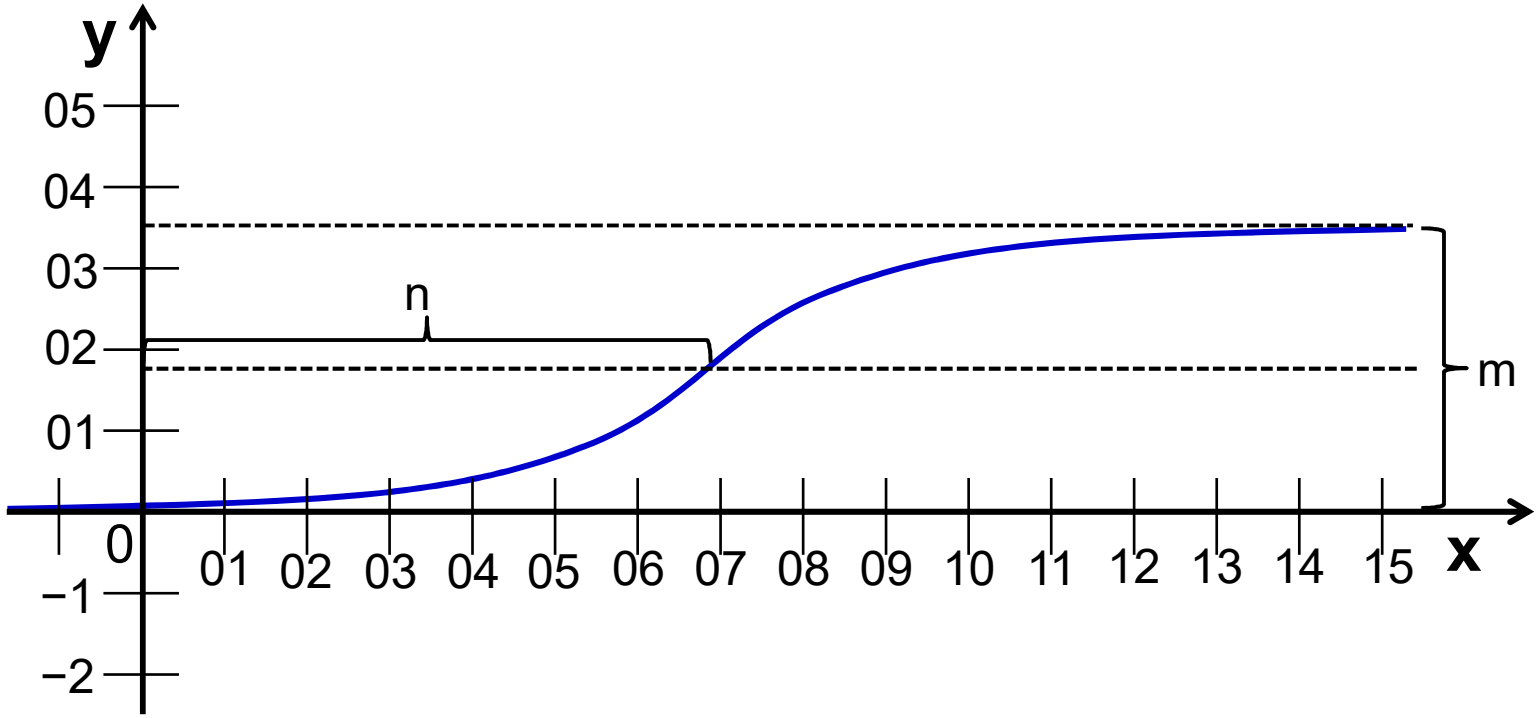
Characteristic: Clearly discernible technical improvements

Sigmoid Curves (S-Functions), Performance Limits.



Characteristic: Clearly discernible technical improvements

Sigmoid Curves (S-Functions), Graphic Representation.



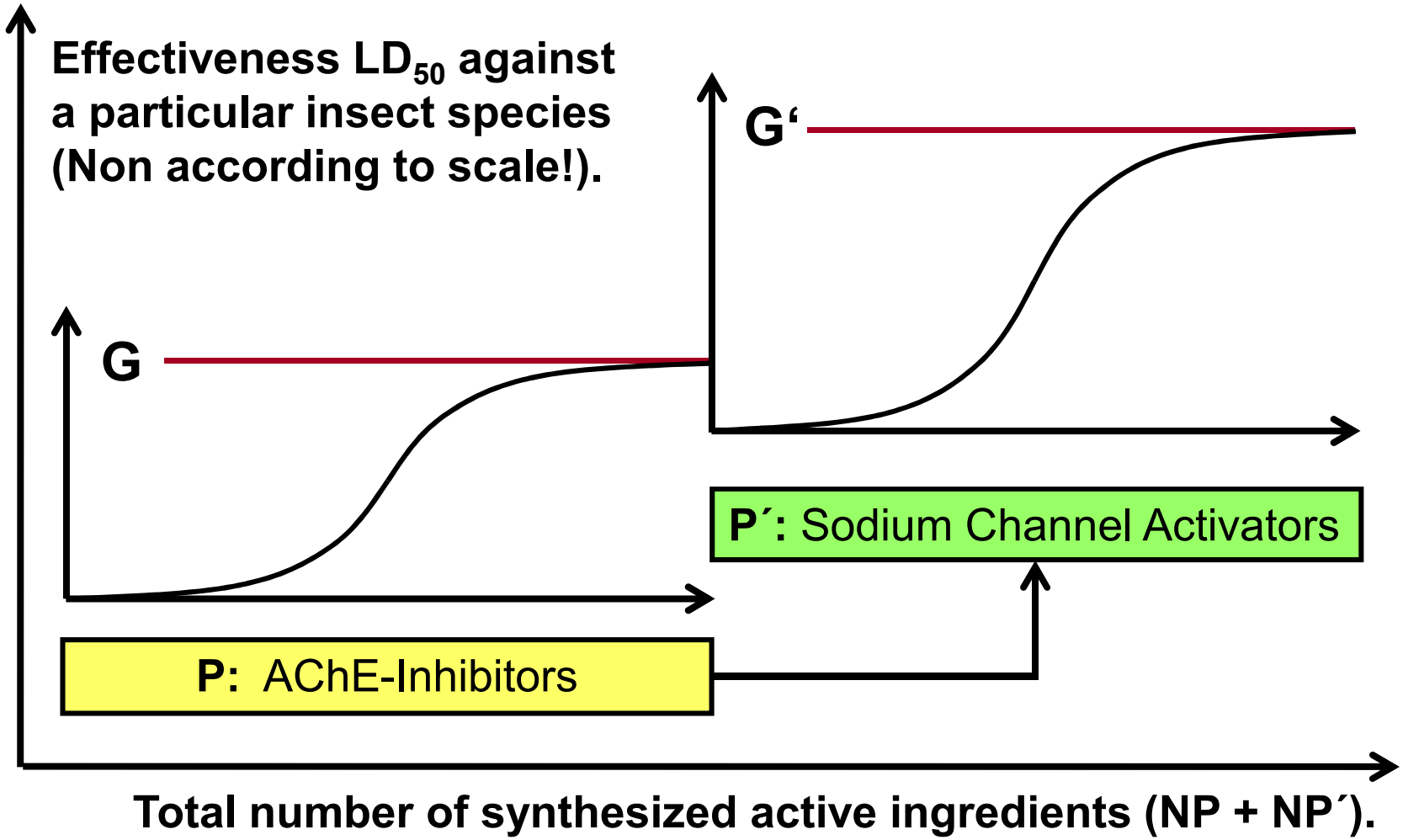
S-Function ("Swan Neck Function", a>0)	$y = f(x) = \frac{m}{1 + e^{-a(x-n)}}$

Rainer Buerstinghaus

Technical "Quantum Leap"

Example

Insecticides: Sigmoid Curves (S-Functions).

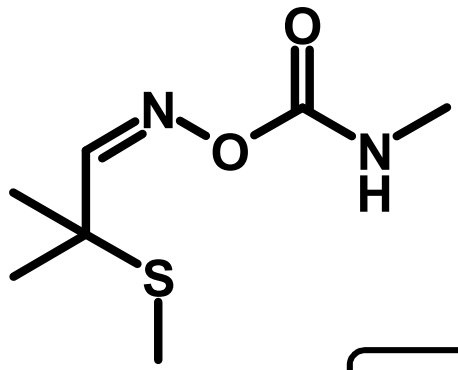


Rainer Buerstinghaus

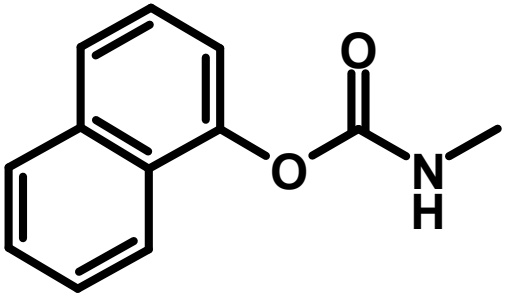
Acetylcholinesterase(AChE)-Inhibitors

Insecticidal N-Methylcarbamates.

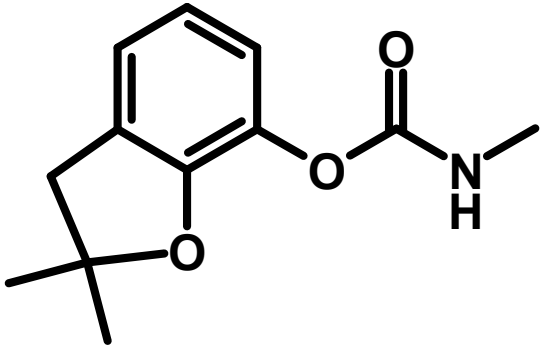
"Common Names"



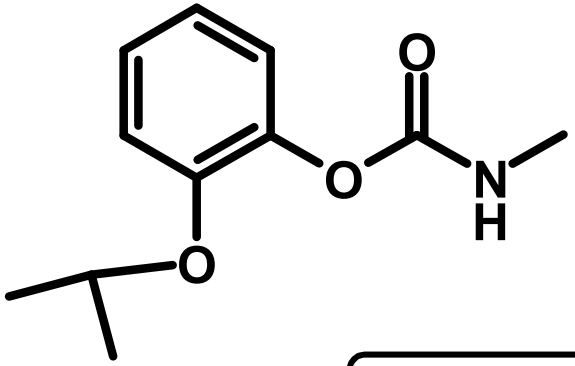
Aldicarb



Carbaryl



Carbofuran



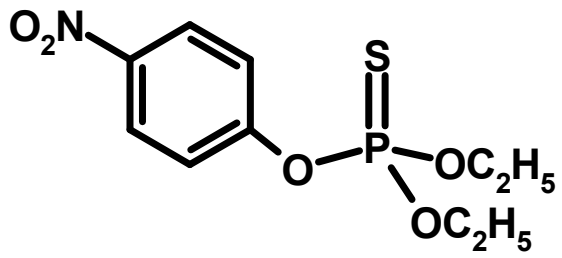
Propoxur

Rainer Buerstinghaus

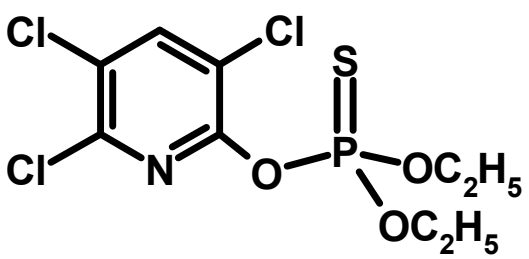
Acetylcholinesterase(AChE)-Inhibitors

Insecticidal Phosphoric Acid Esters.

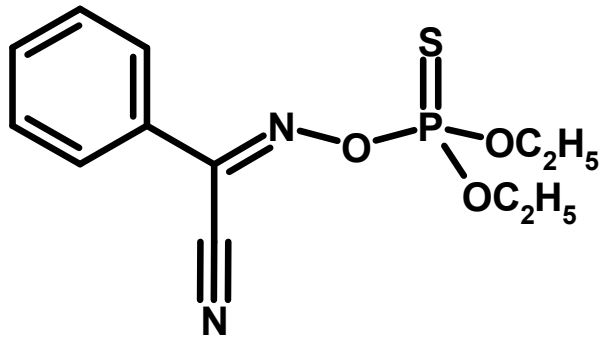
"Common Names"



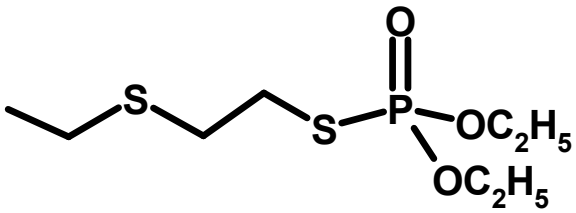
Parathion



Chlorpyrifos



Phoxim



Demethon-O

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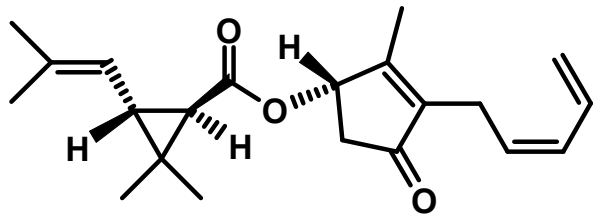
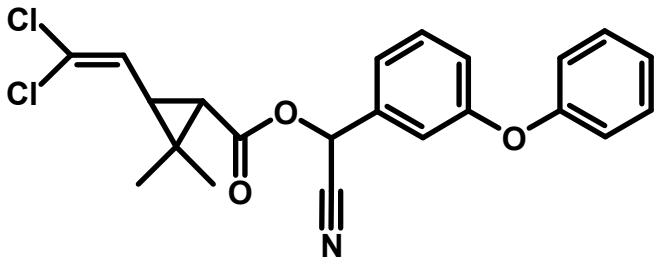
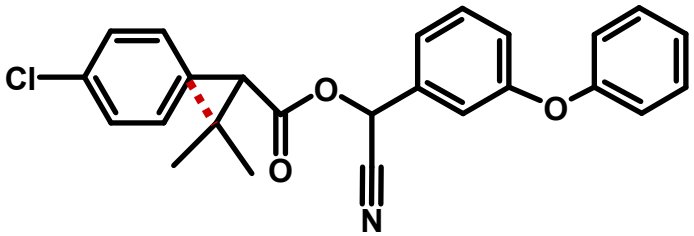
Sodium Channel Activators, **Pyrethroid Variants:**



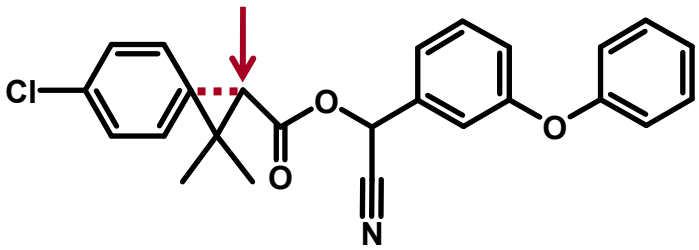
Pyrethrin I, (Chrysanthe-mum, Natural Product)



Cypermethrin (Shell plc)
(Mixture of Stereoisomers)



Fenvalerate (Sumitomo, J)
(Mixture of Stereoisomers)



Inactive laboratory product.
Oxidative functionalization
in the insect organism (?)

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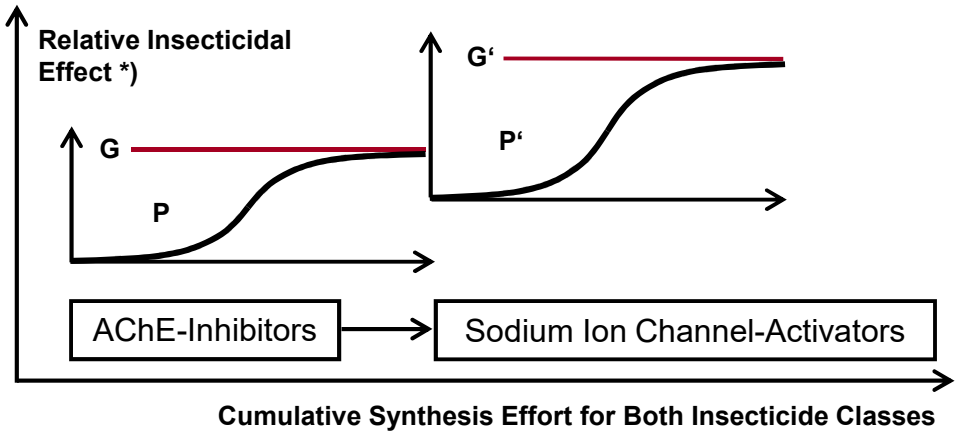
Exchange in the Group of Active Ingredients

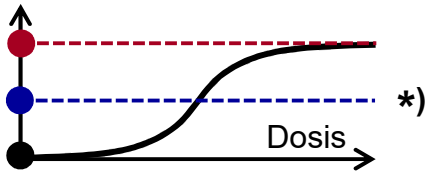
AChE-Inhibitors by Sodium Ion Channel-Activators.

The relative insecticidal effect must be related to ***one*** species of insect!

*) For reasons of clarity, a **presentation not according to scale** has been chosen here.



	AChE-Inhibitors	Na-Ion Channel Activators
Relative effects at *one* species of insect	**1x**	**≈ 10x-100x**
Toxicity Rats, Peroral, LD_{50}*); Lethal Dose	**1- 500 mg/kg**	**100 -10000 mg/kg**



- „Maximum Effect Level“
- „50% Effect Level“ *)
- „No Effect Level“

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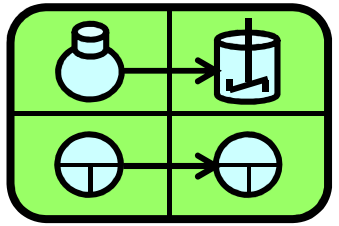
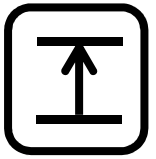
R&D Project Management
in the Chemical Industry



Information Material *for the subject matter:*
Innovation, jump of the technical progress.



See Supplement Module 2 for (Bio) Chemists (m/f/d)

Insecticidal "Sodium Channel Activators".

Insecticidal "AChE Inhibitors".

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Innovations: Characteristics

Individual Features:

- Novelty, in contrast to the hitherto existing.
- Clearly discernible (technical) improvements.
- Inventions mostly provide their basis.
- Laborious, complex processes of emergence are typical.
- Visible or latent risks during the generation.
- "Maturity" is often necessary for "acceptance".
- "Suitable" points in time for market launch are required.
- Demonstrable advantages for the customers / users.
- Economic success for the "innovators".
- Decisions on the overall success (+/−): → Market.

Innovations: Characteristics

Invention: The Problem-Solving Idea.

Latin: inventio –
The invention, the inventiveness.

Inventions

Methods	Results	Benefit
The application of natural laws in a new and creative configu-ration to achieve a real problem solving.	Solved Problems.	Strong Fundament for "True" Innovations.
	Creative Achievements.	
	New Products.	Basis for Legal Protec-tion from Imitations or from Plagiarisms.
	New Processes.	
	Patent Grants.	

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Innovations: Measures for its Promotion

Invention, Importance in Classical Music:

Within Baroque Music ⟶

A small **two- or three-part piano piece** in contrapuntal imitating sentence construction **with only one underlying theme.**

(Examples: J. S. Bach, BWV 772 – 786)

Inventions within Music, Characteristics:

„Auffrichtige Anleitung, Wormit denen Liebhabern des Clavires, besonders aber denen Lehrbegierigen, eine deütliche Art gezeiget wird, nicht alleine mit zwey Stimen reine spielen zu lernen, sondern auch bey weiteren progreßen auch mit dreyen obligaten Partien richtig und wohl zu verfahren, anbey auch zugleich gute inventiones nicht alleine zu bekommen, sondern auch selbige wohl durchzuführen, am allermeisten aber eine cantable Art im Spielen zu erlangen, und darneben einen starken Vorgeschmack von der Composition zu überkommen.“

Verfertiget Anno Christi 1723 von Johann Sebastian Bach, Hochfürstlich Anhalt-Cöthenischen Capellmeister

Inventions within Music, Characteristics:

Johann Sebastian Bach: 1685-1750.

1714: Concertmaster at Weimar.

1723: “Thomaskantor“ at Leipzig.

„Clavier-Büchlein vor Wilhelm Friedemann Bach“.

Explication unterschiedlicher Zeichen, so gewisse manieren artig zu spielen, andeuten….

Wilhelm Friedemann Bach: 1710-1784.

1729: Law Studies at Leipzig.

1746: Organist and Musical Director at Halle.

Sheet Music: See J. S. Bach, „Inventionen und Sinfonien“, Original Text-Edition.
Publisher: G. Henle-Verlag, München, Germany.
Editor: Rudolf Steglich, Fingering: Hans-Martin Theopold.

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Inventions within Music, Characteristics

Invention (Musical Invention, Development / Extension According to the Rules of Composition, "Ars Inveniendi").

- *Solution to a problem* (Preparation of an order composition) through the use of musical skills.
- *Instruction for musical action (Making music)* (Handwritten sheet music, e. g., for the clavichembalo): Theme, theme modification, modulation, augmentation, diminution, detachment, confinement, inversion, cancer, implementation according to the rules of polyphony and counterpoint theory ("punctus contra punctus").
- Special *creative and intellectual achievement*, based on an original "great idea".

Innovations: Measures for its Promotion

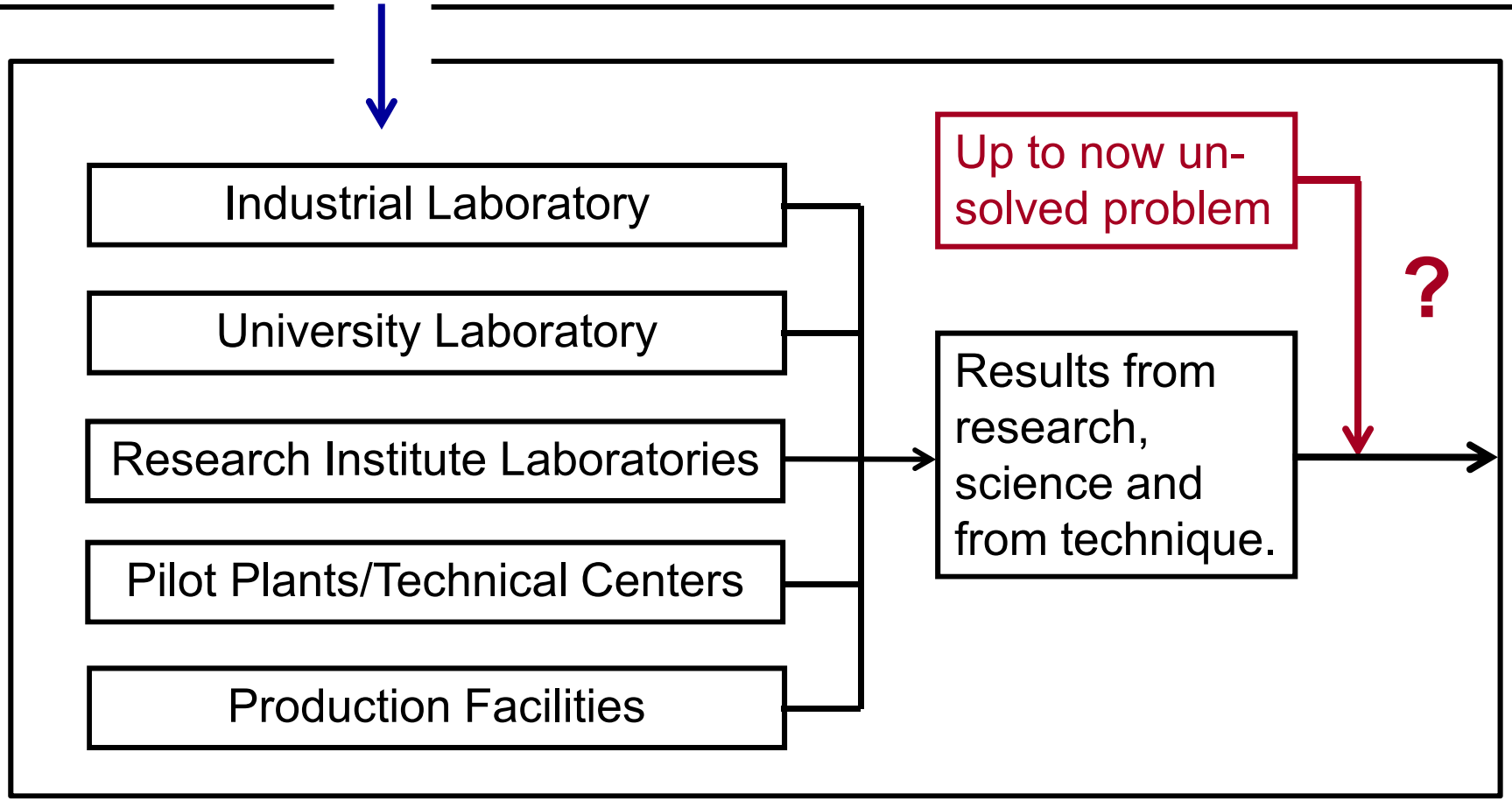
"Effective" Inventions: "Initial Impulses" for Innovations.

Invention (Chemical Invention):

- The effective *answer to an unsolved problem* by using chemical and technical skills.
- *Chemical-technical Teaching:*
  Synthesis instructions, formulations, descriptions of analytical methods, descriptions of analytical results, procedural instructions, exact description of experimental arrangements, evidence of of special material properties or effects.
- Special *creative and intellectual achievement*, based on an original "great idea".

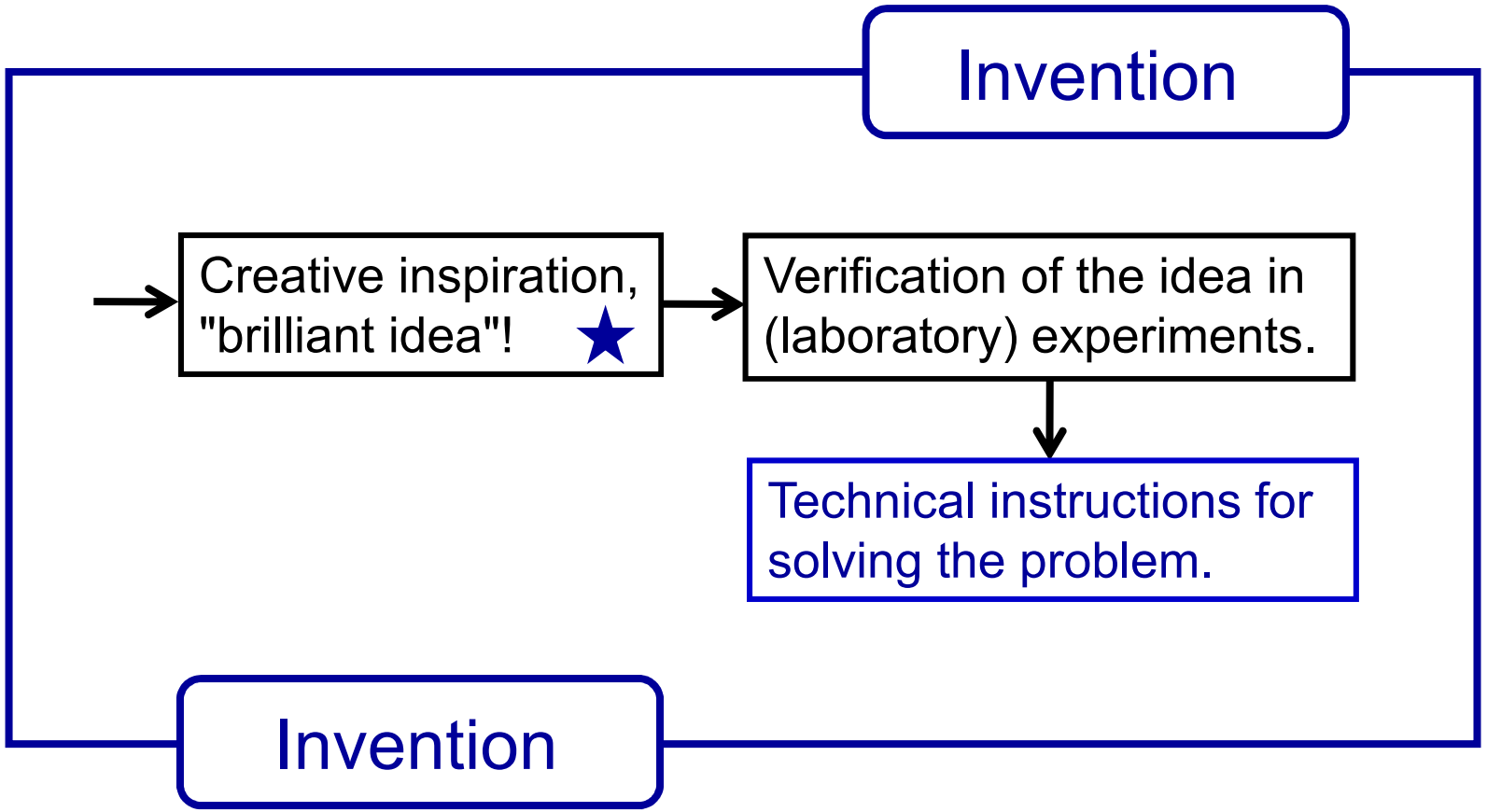
Chemical-technical Invention: Characteristics

Original Idea *and* Instruction for the Solution to a Problem. Sources of Commercially Usable Scientific or Technical Results:



Chemical-technical Invention: Characteristics

Original Idea *and* Instruction for the Solution to a Problem!



Chemical-technical Invention: Characteristics

Original Idea *and* Instruction for Solving a Problem!

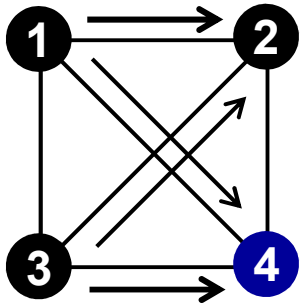
Substances, mixtures of substances or formulations with particular effect or with special physico-technical properties.	Solution to a Problem
(New) synthesis method with better yield and/or higher regio-/stereoselectivity.	
New analysis method.	
Instruction for the solution to a Problem: ▪ Experimental conditions/synthesis instructions. ▪ Apparatuses for analyses/analyses instructions. ▪ Recipes, mixing instructions. ▪ Flow diagrams/circuit diagrams. ▪ Construction plans/“blueprints”.	Technical Instruction(s)

Chemical-technical Invention: Characteristics

Original Idea *and* Instruction for Solving a Problem!

Invention, Discovery: Inventor and discoverer ideally work together **within fully networked systems.**

1	Universities, Research Institutes
2	Published **Discoveries**
3	Companies, Capital Providers
4	Marketed **Inventions**



Universities, Research Institutes,
Primary Interest: Published Discoveries.

Companies, Capital Providers,
Primary Interest: Marketed Inventions.

(K_4): $\begin{bmatrix} 4 \\ 2 \end{bmatrix}$

Inventions: Characteristics

Examples of Recent Inventions in the Chemical Industry:

- New systemic insecticide with selectivity against homoptera.
- New "slow release-formulation" of Ibuprofen®.
- New chiral metal complex for stereospecifical hydrogenations.
- New air stable metal complex for blue light-emitting OLEDs.
- New MOF for the storage of > 10 weight per cent hydrogen.
- New automotive clearcoat, cured with ultra violet light.
- New biodegradable polymer for packaging foils.
- New, more efficient anode material for lithium-ion batteries.

No Invention: The **Discovery**, the **"Finding"**

Exploration: The Exploring of the Hitherto Unknown.

Latin: exploratio – the investigation, the discovery.

Exploration

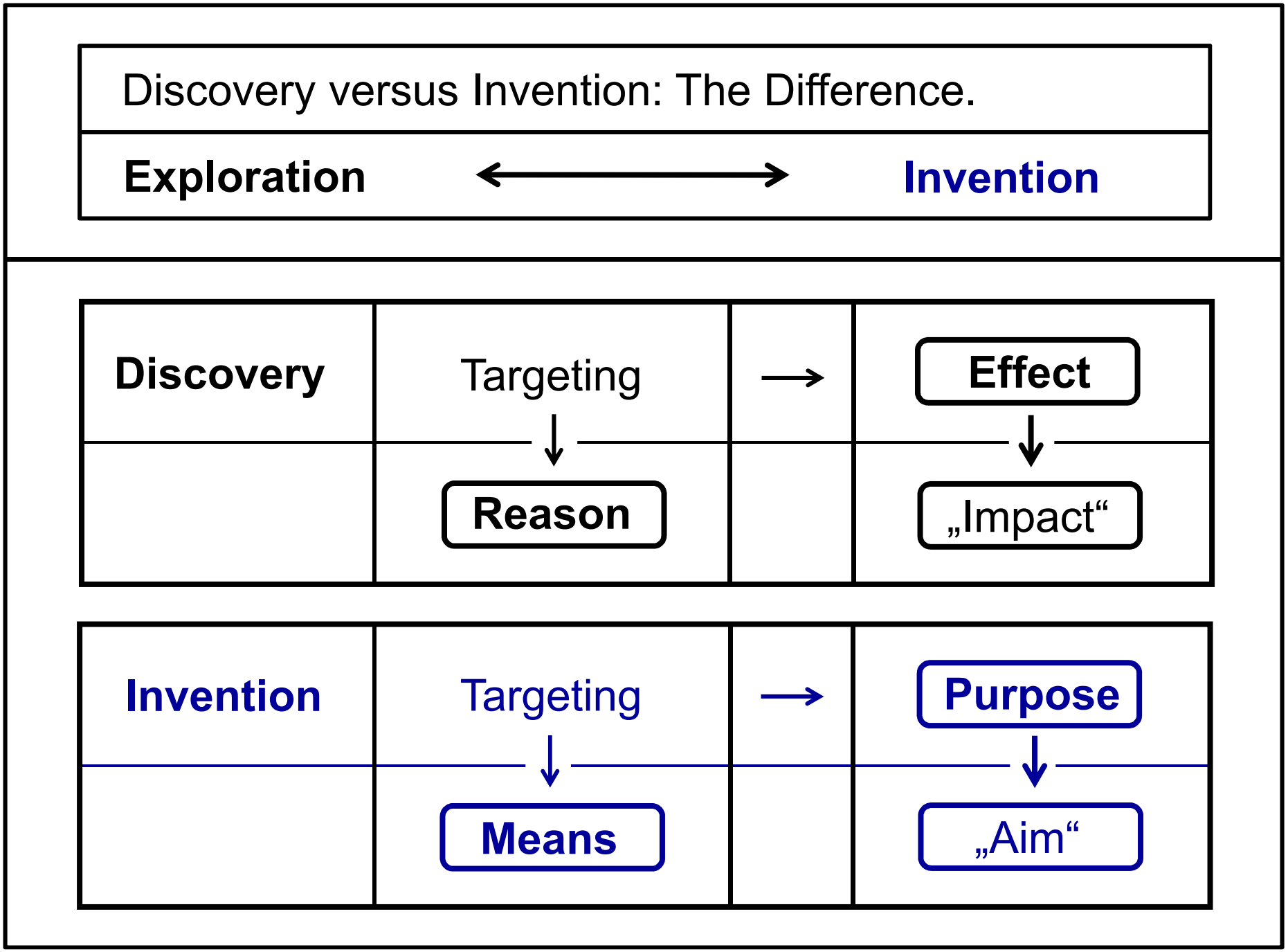
Methods	Results	Benefit
Experiments.	Surprising Effects.	Indeterminated!
Analyses.	Discoveries.	Hardly forseeable!
Measurements.	Knowledge Growth.	But: The results are entirely open for new innovative usages! (Heribert Offermanns)
"Screenings".	Formula, Correlations.	
Observations.	New Insights.	
Expeditions.	Primary Publications.	

No Invention: The **Discovery**, the **"Finding"**

Exploration: The Exploring of the Hitherto Unknown.

Characteristics of Explorations →

- They serve for the discovery/cognition of an existing, unknown (unconscious, or even hitherto still hidden) reality.
- The resulting discoveries are mostly recognized by their effects (effects, phenomena).
- These go hand in hand with knowledge growth.
- The temperament of "explorers" (m/f/d) is characterized by vigilance, curiosity, openness, lack of prejudice, courage, endurance, diligence, precision.
- Typical action areas: unknown territory, "unknown terrain" during expeditions or laboratory experiments, etc.
- The results are not patentable, since already existing!
  But: They can be published and sometimes also be applied!



Discoveries, Inventions, Innovations

Characteristics, Places of Origin, The Involved:

- **Discoveries ("Findings")**

  Novelty

  Universities, research institutes, "new territories", unknown area.

  Explorer, adventurer, expeditionary, attentive observers.

- **Inventions ("Solutions to Problems + Market *Potential*")**

  Novelty, Patentability, Licensability

  (Industrial)Companies, institutes for research under contract.

  Researchers, developers, technicians, "hobbyists", "tinkerers".

- **Innovations ("Solutions to Problems + Market *Success*")**

  Novelty, Patentability, Licensability, Initial Marketability

  Markets, economic territories.

  Researchers, developers, designers, producers, logisticians, marketing professionals, merchants, customers, authorities.

Inventions: Commercial Applications.

Economically Applicable Research Results (€):

Commercial Applicability ⟶

"Commercial applicability **is then the case, if the subject-matter of the invention can be manufactured or used in any industrial field…**

Business people and traders (EStG §15) are primarily striving for economic success".

"Freelancers: Doctors, Lawyers, Artists, Authors, etc., are *no business people*. For all these mentioned professions, the use of capital fades into the back-ground against their intellectual work...(EStG §18)"**…☺…**

Inventions: Commercial Applications

"Future Perspectives" for Chemical Inventions, Fields:

Chemistry	Paper Manufacture	Sports Equipments
Chemicals Trading	Metal Production	Pharmaceuticals
Oil/Gas	Metal Processing	Medical Technology
Agriculture	Electrical Appliances	Textile/Clothing
Biotechnology	(Opto)Electronics	Packaging Materials
Vehicle Production	Surface Technology	Foods
Automotive Supplies	Coatings/Colors	Beverage Preparation
Structural Engineering	Print (Colors)	Plastics Production
Civil Engineering	Glass/Flat Glass	Plastics Processing
Aviation/Aerospace	Cosmetics	Armaments/Military

Inventions: Commercial Applications

Chemical Industry 2020, Global Factors of Influence:

- (De)Globalization / (Trans)Nationalization
- (De)Regulation Trade Acts (Customs)
- Internet / WWW / A. I. Robotics / Industry 4.0
- Demografic Change and Megatrends 2030
- Environmental Laws "CO_2 – Neutrality"

- Dynamics in the World Market
- Trend to "Green Chemistry"

Inventions: New Products

Inventions: New Processes

Inventions: New Systems

- Financial/Capital Markets
- Volatility of numerous Values

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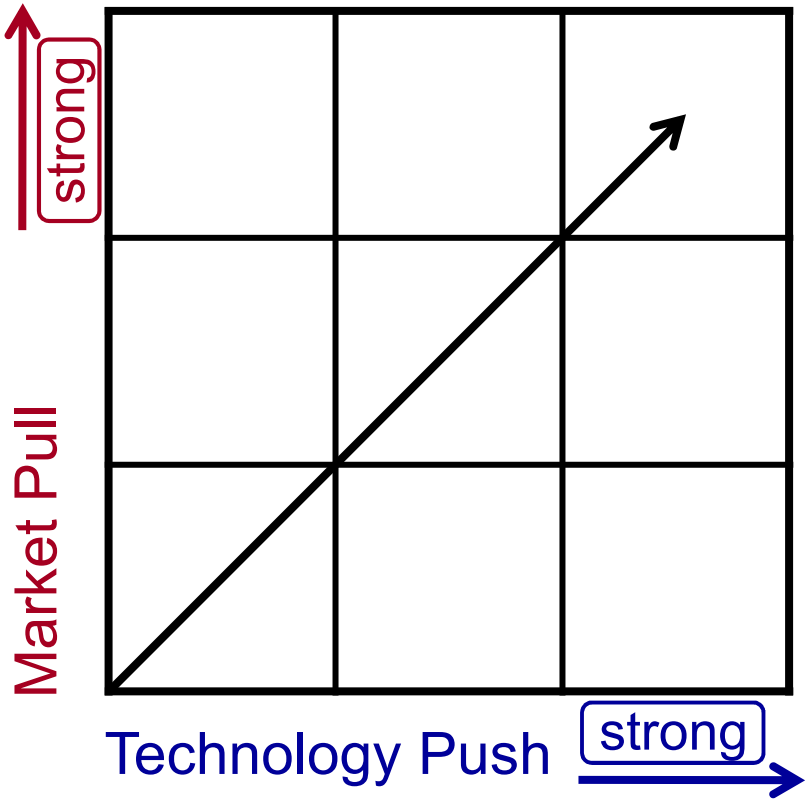
Inventions: Commercial Applications

Prerequisite: Effective Push-Pull Mechanism

Commercial Application: **"Push *and* Pull"**
Result: ⟶ Economic Success (€).

Invention: (Solution to a general problem).

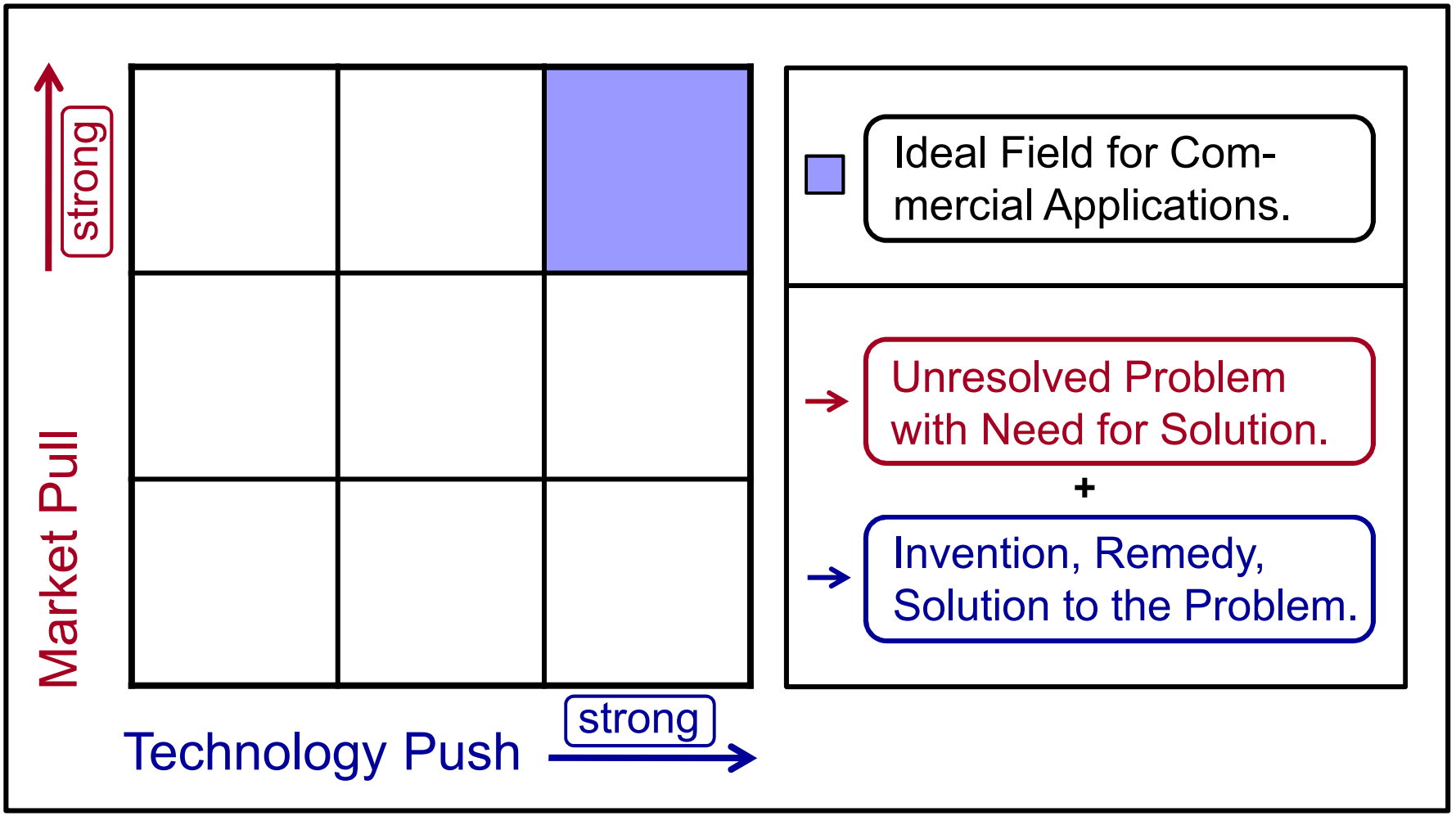


Market Requirements:
Suction into the Market
"Market Pull"

Own Offer :
(Product/Procedure)
"Technology Push"

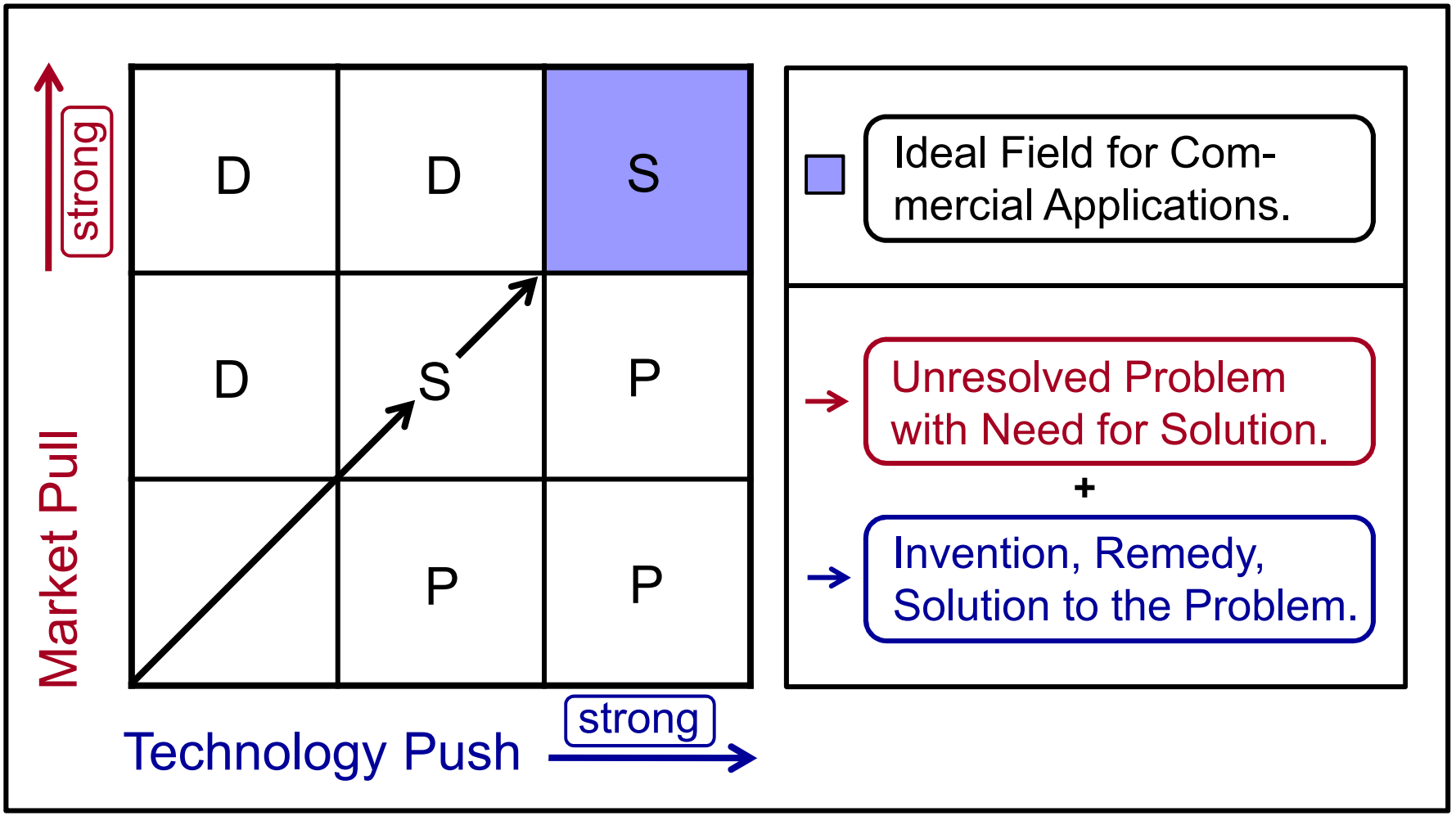
Inventions: Commercial Applications

Push-Pull-Mechanism.



Inventions: Commercial Applications

Push-Pull-Mechanism ("Pusher" P, "Dragger" D, "Big Seller" S).



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Inventions; Commercial Applications

Indispensable Milestones between Exploration and the *Widespread* Application / Use (€).

Exploration	⟷	Research Results (→ Publications). If possible: (→ Patent *Applications*).
Invention	⟷	**Solution to a Problem ★** **(→ Patent Protection).**
Innovation	⟷	Realized R&D Project (→ Market Success).

- Sustainable Benefit for the Customers.
- Common Use.
- Return/Yield for the "Innovator".

$!

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Inventions: Property Right, Copyright

Protection of Original "Intellectual Property"
for an *Exclusive* Commercial Application/Use:

Two fundamentally different types of law for the protection of intellectual property in the form of international prohibitive rights:

1. Industrial Property Rights (Intellectual Property)
2. Copyright©

- **Industrial Property Rights (Intellectual Property)**
  - Registration with the patent authority is required.
  - Transferability to other owners is possible.
  - Allocation of rights of use (licenses) is possible.

Inventions: Property Right, Copyright

Protection of Original "Intellectual Property"
for an *Exclusive* Commercial Application/Use:

Two fundamentally different types of law for the protection of intellectual property in the form of international prohibitive rights:

1. Industrial Property Rights (Intellectual Property)
2. Copyright©

- **Copyright**
  - No application / registration is necessary.
  - Stricty personal, non-transferable.
  - However, the usage rights can be licensed.

Inventions: Industrial Property Rights

"Intellectual Property" ("…Intellectual Ownership…").

- Patents and utility models
  (Legally protected technical **Inventions**).
- Trademarks.
- Design rights ("Registered design").

Inventions: Industrial Property Rights

Patents: Property Rights Basing upon Inventions.

Existing Knowledge
+
Creative, Great Idea

→

Solution to a Problem:

Technical Teaching
for its Execution.

Property Right, Requirements

- Patentability (Formal requirements √, "Technicity"√).
- Novelty.
- Inventive Step.
- Industrial Applicability.

⟶ Decision+/−: Scientific Community *and* Patent Office.

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Inventions: Industrial Property Rights

Patents: Property Rights Basing upon Inventions.

Inventions are based on inventive activities. The latter are achievements which "average experts" can not provide.

"Persons Having Ordinary Skills in the Art":

Juridical fiction: They encyclopedically have excellent skills in their area of expertise (SciFinder®, Brockhaus®, Google®, facebook®, WIKIPEDIA®, Baidu®, YouTube®, Bing®, twitter®, web.de, Chemical Abstracts, Houben-Weyl, Beilstein, etc…)

↓

That means, they have access to the entire, relevant state of science and technology. However, their skills can only be routinely, "robotically" developed further.

Inventions: Industrial Property Rights

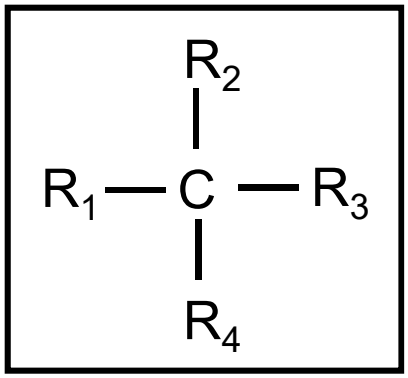
Property Right, Prerequisite: Patentability!

***Not* Patentable!** ⊖ ⟶

- Discoveries (e.g.: "dark matter" in the cosmos).
- Scientific theories (e.g.: the MO-theory).
- Mathematical methods (e.g.: determinated algorithms).
- Aestetic form creations (e.g.: sculptures).
- Rules of (card)games (e.g.: those of Chemundo®).
- Non-uniform items (e.g.: "panaceas").
- Products or procedures that violate morality, socially accepted values and norms and/or violate public policy (e.g. radar warning or laser jamming devices when driving).

Inventions: Industrial Property Rights

Not Patentable: Non-Uniform Items ("Optional", "All").



→ Lack of unity in the molecular structure

→ Lack of unity in the solution to a problem

R_1, R_2, R_3, R_4, are identical or different: ⊖

(Hetero)Alkyl, (Hetero)Alkenyl, (Hetero)Alkinyl, Cycloalkyl, Carboxyl, Alkoxycarbonyl, Aryl, (substituted) Aryl, Heteroaryl, (substituted) Heteroaryl, Hydrogen, Hydroxyl, Hydroxyalkyl, Alkoxy, (substituted) Phenoxy, (Alkyl)Amino, (Aryl)Amino, Aminoalkyl, Halogen, Thiol, Thioalkyl, (substituted)Thioaryl, Phoshoralkyl, Phosphoraryl, each with linear or branched C_1 to C_{200}, Metals, Metalorganic substituents, Metal Ions,.....respectively.

Use as: ⊖

Pharmaceutical composition, pharmaceutical agent, plant protection agent, fragrance, vitamin precursor, plastic additive, coating agent, lacquer component, solvent, dispersing aid, defoamer, flocculant, colorant, effect agent, textile aid, semiconductor, electrode material, electronic chemical, detergent, cleaning agent, glue, insulation material, etc.

Inventions: Property Rights

Patent Application, Argumentation:

- The state of he art is deficient
  "…this has the particular disadvantage that…"
- The invention is sustancially more advantageous
  "…Surprisingly, it has been found that…has a significantly better effect/property, (etc.)…"
- The invention has therefore to be protected by a patent.
- Patent Claim: (Abstract) Generic term,...
  "..., which is characterized by..."

Inventions: Property Rights

Unexamined Laid-Open Patent Application (Code A1/A2):

Appears 18 months after the priority date.

- Serves to inform the public.
- It marks the print-written state of the art.
- There is no checking in terms of chemical-technical contents, there is only a formal input check.
- Therefore, opposition is not yet possible!

Inventions: Property Rights

Patent Specification (Code B1/B3/B4).

Appears *after* the patent grant!

- The criteria for patentability are fulfilled according to the guidelines of the patent office.
- The patent is granted by the patent examiner.
- Publication in electronic form.
- Possibility of opposition (Deadlines!).
- Duration: Worldwide 20 years from registration.

Inventions: Property Rights

Opposition ("Objection").

!	Everyone is authorized to do it! Condition: In a written form and in an official language of the patent office.
→	The reasons must be stated.
→	The burden of proof lies on the opposer!

The deadlines (After the patent grant)	
D, CH	9 Months
EPA	9 Months
J	6 Months
U. S. A.	No formal time-limit

Inventions: Property Rights

"Strategic Patent Application" (e. g. : "Paper Patent…").

Basis, e. g. : **Strategic "Inventions at the Desk".**

→ Important:
The feasibility must convincingly be set out
in the experimental descriptions.

→ Purpose:
To significantly expand the state of the art,
to prepare the ground for own key innovations.

Inventions: Property Rights

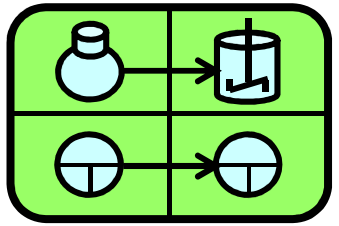
Strategically Oriented Invention.

→ Wide Range of Application / Openness / Speed!

Narrowly Limited Selection Invention.

→ Accuracy, the focus lies on a (new)
very particular application in the market.

R&D Project Management
in the Chemical Industry



Information Material *for the subject matters:*
Strategic Invention / Selection Invention.

See Supplement Module 2 for (Bio) Chemists (m/f/d)

"DNA Computer for Massive Parallel Data Processing".

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Innovations: Characteristics

Individual Features:

- Novelty, in contrast to the hitherto existing.
- Clearly discernible (technical) improvements.
- Inventions mostly provide their basis.
- Laborious, complex processes of emergence are typical.
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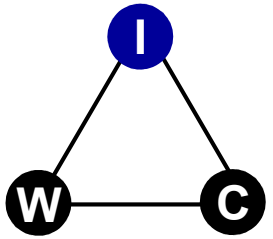
- "Maturity" is often necessary for "acceptance".
- "Suitable" points in time for market launch are required.
- Demonstrable advantages for the customers / users.
- Economic success for the "innovators".
- Decisions on the overall success (+/−): → Market.

Innovations: Characteristics

Economic Success for the "Innovators".

Triad of **Innovations**, **Capital** and **Work:** J. A. Schumpeter (1905).

Steady interactions between innovation, capital and work.



"Enterprise Dynamics, Acceleration Factors"	
I	**Innovations**
C	Capital
W	Work, Workplaces

(K_3): $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$

Innovations: Characteristic "Economic Success"

Companies Strategic Objectives:

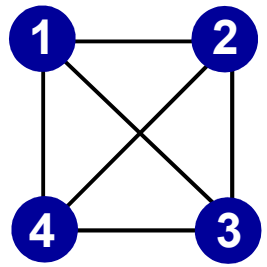
- Generation, consolidation and defense of a stable, positive net earnings situation.
- Guarantee of the financial balance.
- Designing the technical progress.
- Maintenance and consolidation of a good market position.
- Sustainable environmental/climate protection.
- Effective occupational safety measures.
- Preservation of the social peace.

Innovations: Characteristic "Economic Success"

Balanced Scorecard : "Compass" for the Corporate Success.

Finance			
Targets			
Key Data			
Specifications			
Measures			

Customers			
Targets			
Key Data			
Specifications			
Measures			



Internal Processes			
Targets			
Key Data			
Specifications			
Measures			

Learning & Development			
Targets			
Key Data			
Specifications			
Measures			

(K_6): $\begin{bmatrix} 4 \\ 2 \end{bmatrix}$

1	Finance
2	Customers

3	Internal Processes
4	Learning & Development

"Score Factors"
Their Cross-Link

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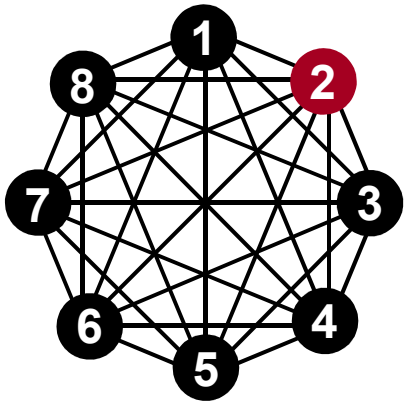
Innovations: Characteristic "Economic Success"

Extended "Navigation System" for the Corporate Success.

1	Market Position in Core Business
2	→ **Innovative Strength**
3	Growth in Digitization (Robotics, A. I.)
4	Productivity (Work, Time, Capital, Knowledge)
5	Effective Leaders and Coworkers
6	Top Environmental / Climate Protection
7	Solvency and Cashflow
8	Profitability and Profit Margin

2 **Innovative Strength**: Directly accessible "thrust effect" with regard to new products, processes, services and more effective forms of cooperation.



(K_8): $\begin{bmatrix} 8 \\ 2 \end{bmatrix}$

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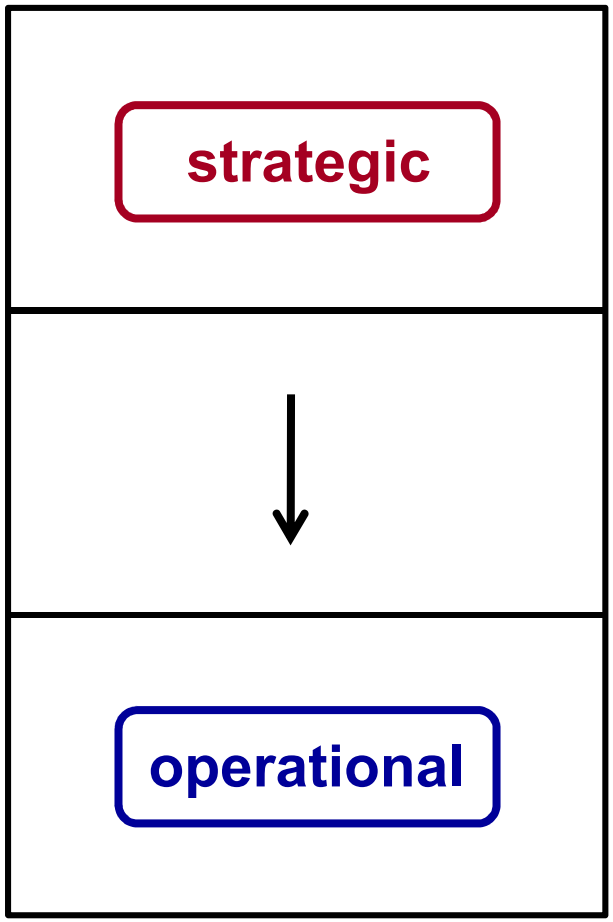
Innovations: Characteristic "Economic Success"

Management Tasks in Successful Companies:

1	**Innovation Management**
2	Financial Management
3	Human Resources Management
4	H. S. S. E. Management *)
5	Portfolio Management
6	Technology Management
7	Customer Management
8	Product Management
9	**Project Management**

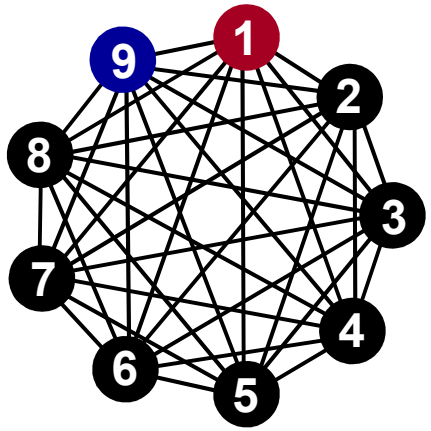


*) Health, Safety, Security and Environment Management

Innovations: Characteristic "Economic Success"

Management Tasks in Companies, their Crosslinking.

1	**Innovation Management**
2	Financial Management
3	Human Resources Management
4	H. S. S. E. Management *)
5	Portfolio Management
6	Technology Management
7	Customer Management
8	Product Management
9	**Project Management**



(K_9): $\begin{bmatrix} 9 \\ 2 \end{bmatrix}$

*) Health, Safety, Security and Environment Management

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Management Tasks in Companies, Equivalence.

R&D Strategy		**R&D Operations**
(K_2): $\begin{bmatrix} 2 \\ 2 \end{bmatrix}$	For effective R&D management, the R&D strategy ***and*** the R&D operations must be fully linked! Each of the two has the same importance!	

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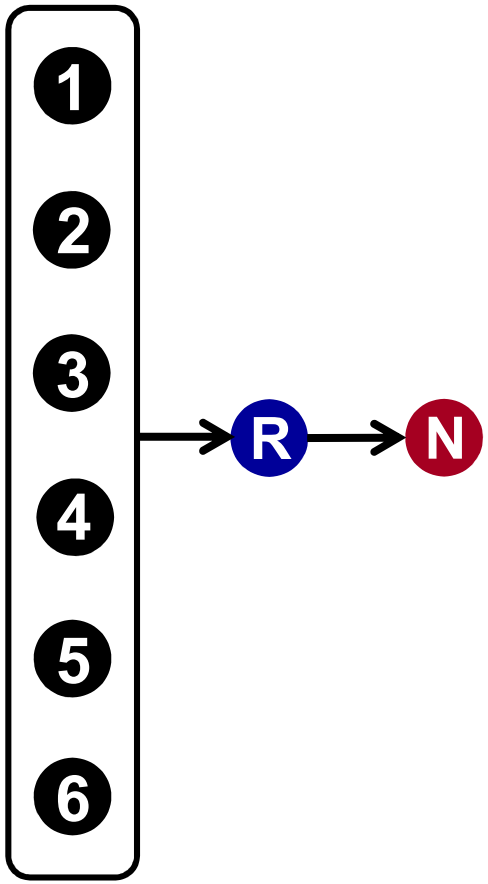
Innovations: Characteristic "Economic Success"

Chemical Industry, Characteristics

- High research intensity.
- Large investment volumes.
- Substantial shares of fixed capital.
- Numerous value chains.
- Coupling productions and material cycles.
- High efforts for environmental protection and security.
- Intensive transnational trade.
- Few end consumers as customers.

Innovations: Characteristic "Economic Success"

High Research Intensity: Factors (n) that Directly Affect Productivity in Research and Development!

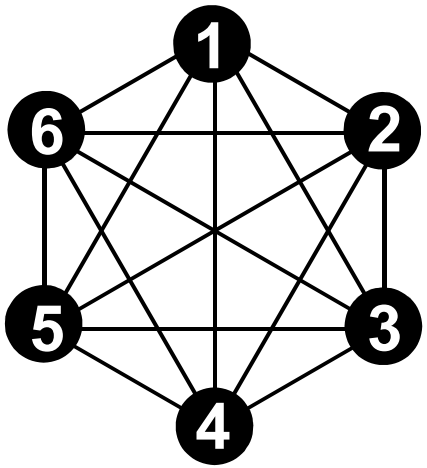


R	**R&D Productivity**
N	**New Products; New Procedures**
1	First Class Qualification of the Staff.
2	Access to the Latest Science and Technology.
3	Precise Knowledge of Customers and Markets.
4	Top Lab-Equipment/Technique/Automation.
5	Professional Planning (Objectives, Dates).
6	Enough Workforce (FTE); Funds ($, €).

FTE ⟶ Full-Time Equivalent, / - Employee.

Innovations: Characteristic "Economic Success"

High Research Intensity: Factors (n) that Directly Affect Productivity in Research and Development!



(K_6): $\begin{bmatrix} 6 \\ 2 \end{bmatrix}$ → R
→ N

R	**R&D Productivity**
N	**New Products; New Procedures**
1	First Class Qualification of the Staff.
2	Access to the Latest Science and Technology.
3	Precise Knowledge of Customers and Markets.
4	Top Lab-Equipment/Technique/Automation.
5	Professional Planning (Objectives, Dates).
6	Enough Workforce (FTE); Funds ($, €).

FTE ⟶ Full-Time Equivalent, / - Employee.

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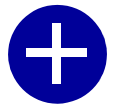
Innovations: Characteristic "Economic Success"

R&D Projects, Phase:
Preparation/Start ⟶ Key Success Factors.

- Clear corporate strategy.
- Defined market strategy.
- Defined product strategy.
- In advance: Business-Case.
- Openness.
- Entrepreneurial courage.



Determination!

Hesitancy!

Innovations: Characteristic "Economic Success"

R&D Projects, Phase:
Laboratory/Application Tests → Key Success Factors.

- High creativity.
- Systematic laboratory planning.
- Completed series of tests.
- Proof of feasibility.
- Patent applications.
- Market relevance/conformity.
- No pressure from business.

Completeness!

Time Pressure!

Innovations: Characteristic "Economic Success"

R&D Projects, Phase:
Pilot Plant ⟶ Key Success Factors.

1 kg ⟶ 500 kg (Scale-up)

Elaboration of the process chemistry.
Elaboration of the process engineering.

⟶ Guarantee for the availability of all chemicals.

⟶ Clarification of logistics, material flows.

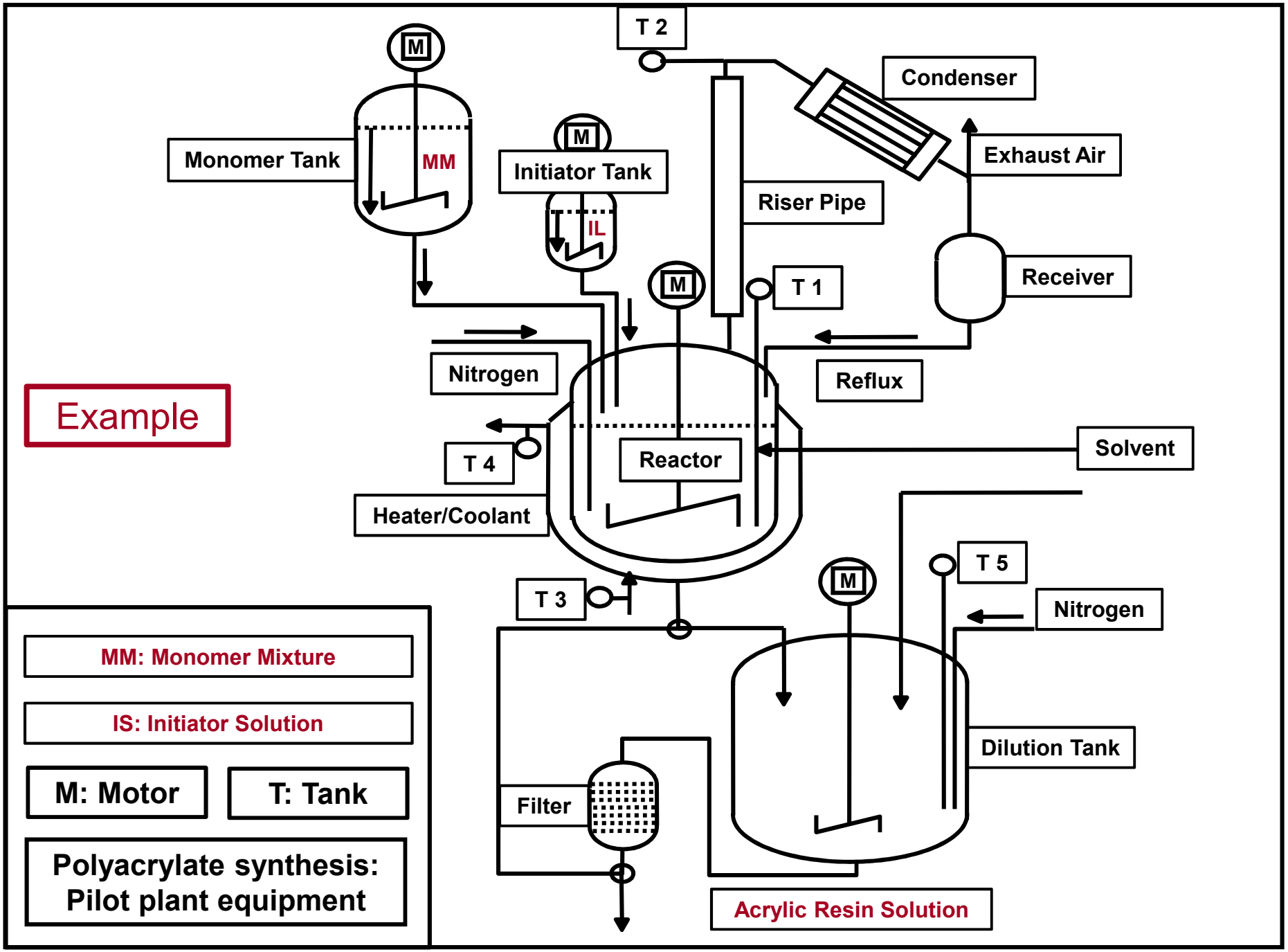
⟶ Availability of equipment/installations.

⟶ Possibly start of an investment project study.

⟶ Setting up of a QA-System.

Pilot Plant, Elements of Standard Equipment:

Pipelines	→	Connections of apparatuses: Transport of gases, liquids, powders, granules.
Armatures	→	Instruments for the quantity regulation of material flows in pipelines.
Reactors	→	Devices for carrying out material transformations/chemical reactions.
Process Engineering Devices	→	Equipment for heating, cooling, mixing, filtering, separating, drying.
Machinery	→	Electromechanical "energy suppliers" for the mobile parts of the apparatus.
Conveyor Technology	→	Movable systems for time-controlled material and substance transports.
Measuring-, Control- and Regulation Devices	→	Online tools for recording and controlling of processes.
Storage Equipment	→	Tanks, tank waggons and packaging for temporary or permanent storage.



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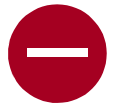
Innovations: Characteristic "Economic Success"

R&D Projects, Phase:
Pilot Plant ⟶ Key Success Factors.

- Appropriate technology.
- Clear security rules.
- Environmental Protection.
- Strict implementation.
- Clearly defined logistics.
- Sure access to raw materials.
- Speediness.
- High product quality.

Focusing!



Creativity!

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R&D Enterprises, Phase:
Production ⟶ > 500 kg.

Decision:
(◇)

a) Continuous Operation
b) Batch Operation

⟶ "Frozen" Process.
⟶ If necessary: Investment project.
⟶ Initiation of approval procedures.
⟶ Installation of the equipment.
⟶ Preparation for commissioning.
⟶ Experimental production.

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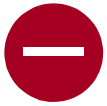
Innovations: Characteristic "Economic Success"

R&D Projects, Phase:
Production ⟶ Key Success Factors.

- Restrictive execution.
- Clear security rules.
- Environmental protection.
- Optimal logistics.
- Constant product quality.
- Reliable delivery capability.
- Effective controlling.

Strictness!



Changes!

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Checking: Production Capacity in the Existing Facilities.
If Neccessary: Planning of a New Construction or the Conversion of Existing Plants.

100 %	→	Start of Production
100-x %	→	Investment Project
000 %	→	Investment Project

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Production Planning, Content and Actions.

- Planning of the product groups to be manufactured.
- Planning of the individual products to be manufactured.
- Planning the manufacturing processes.
- Planning of all required materials.
- Planning and calculation of the life cycle assessments.
- Planning of the (maximum) capacity frameworks
  (Source materials, operating materials, equipment,
  I. T., robotics, energy balances, workforce requirements).

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Economically Effective Production Targets.

- High plant productivity.
- Low costs of production.
- Comparatively short processing times.
- Innovative synthesis methods, prior art.
- Preferably continuous procedures.
- Flexibility through the use of multipurpose systems.
- Small scrap quantities, high product quality.
- Permanent profitability / Economic efficiency.

Innovations: Characteristic "Economic Success"

Qualitatively Effective Production Targets.

- Understandable, unambiguous work instructions.
- Reproducibility of the manufacturing processes.
- Specification-compliant products of high purity.
- Constant product quality.
- Reliable deliveries (quantity, purity, deadline).
- Very low number of returned goods (complaints).

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Socially Effective Production Targets.

- Long-term designed and sure jobs, linked with real value-adding activities.
- First-class and reliable protective devices.
- Ergonomically arranged workplace layouts.
- Accepted shift-work and flexitime models.
- Coordinated and flexible working time plannings.
- Fair payments for the respective work results.

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Ecologically Effective Production Targets.

- Climate-neutral manufacturing processes, ressource-saving fabrication methods.
- Low energy and water consumption.
- Low environmental impact (effective pollutant filters, functioning sewage treatment plants).
- Absolute surely working protective devices.
- Untoxic, little persistent (intermediate) products.
- Safe filling and storage facilities.
- Risk-free means of transport/transportation routes.

Innovations: Characteristic "Economic Success"

Production Indicators ("Output" / "Input"):

Economic Efficiency → $\frac{\text{Production Output (€)}}{\text{Production Input (€)}}$

Productivity → $\frac{\text{Production Output (t)}}{\text{Production Input (€)}}$

Labor Productivity → $\frac{\text{Production Output (t)}}{\text{Number of Employees (FTE)}}$

→ **FTE**: Full-Time Equivalent (One (Wo)Man-Year)

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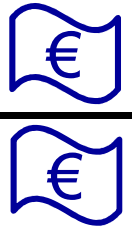
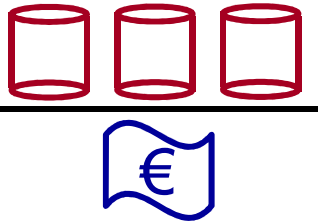
Innovations: Characteristic "Economic Success"

Production Indicators ("Output" / "Input"):

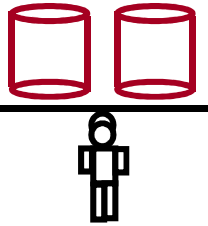
Economic Efficiency →



Productivity →



Labor Productivity →



→ **FTE**: Full-Time Equivalent (One (Wo)Man-Year)

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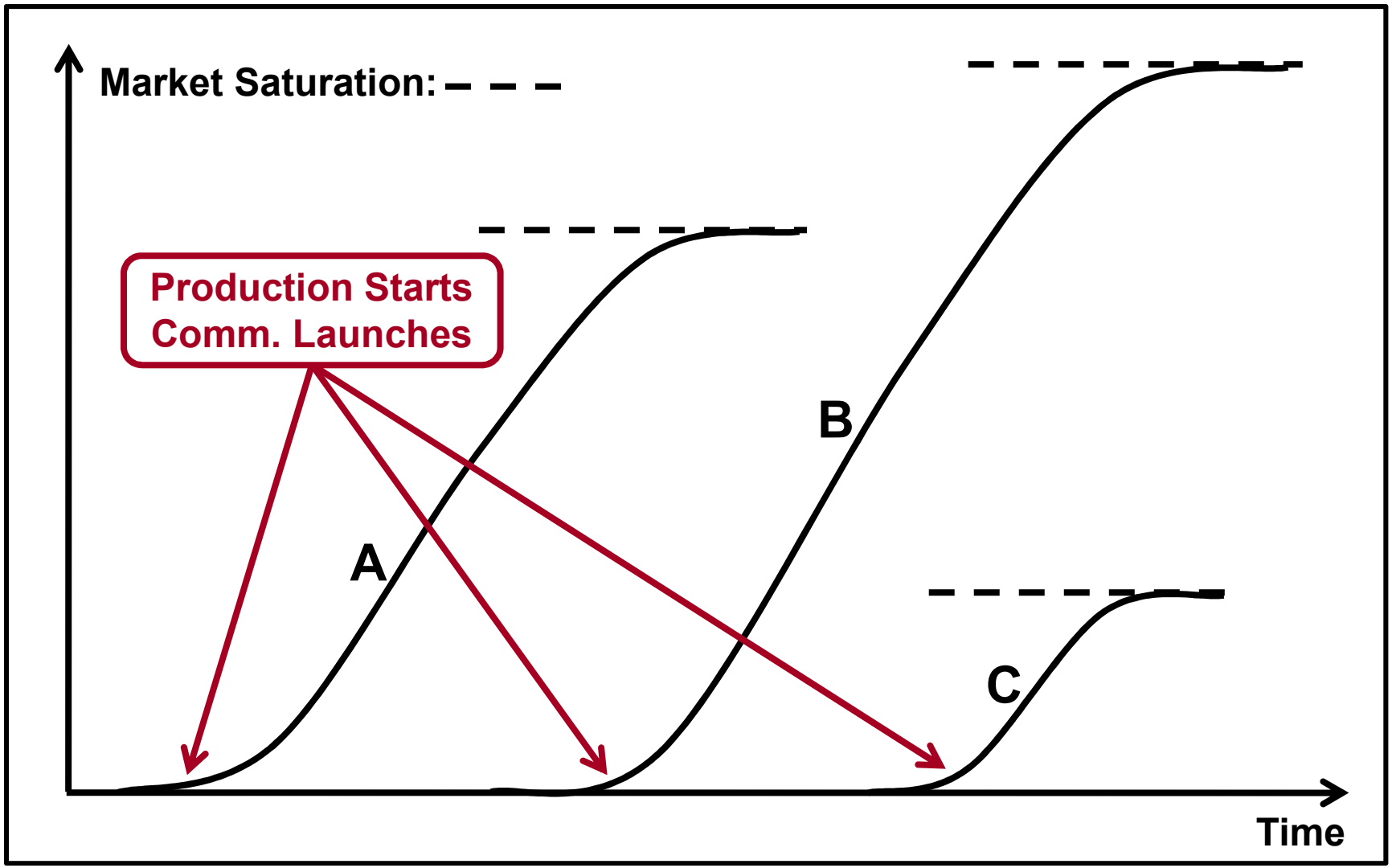
Innovations: Characteristic "Economic Success"

Continuous Innovation Process within a Company.



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Innovations: Characteristic "Economic Success"

Determining Economic Success for the Innovator:
Business Performance Indicators: ⟶

- Sales Volume.
- Turnover.
- Variable Costs / Fixed Costs.
- Contribution Margin I / II.
- Gross Operating Result / Operating Result.

- Depreciation.
- EBITDA / EBIT.
- Cashflow.

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Sales Volume:

→ Quantity of delivered products (services).

Examples:

53 t Cu-Phthalocyanine.

8000 l n-Butanol.

4 m³ Waterborne basecoat.

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Turnover

Amount of sold goods (services) x sales price.

Examples

Cu-Phthalocyanine	53.000 kg	x € 8,30/kg	= € 439.900,00
n-Butanol	8.000 l	x € 2,15/l	= € 17.200,00

Net Turnover (N. T.), Clear Turnover:

Sales *less* [value-added tax (V. A. T. , in Germany currently 19%) and, if necessary, sales reductions through price reductions by making complaints or by customer credit notes].

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Costs, Expenses, Definitions: →

- Performance-related, monetary-based consumption (Goods/Services) in a business.
- Expenses from the utilization of goods and services for the provision of products in a company.
- Regular operational, monetary-based consumption of goods and services in one period.

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Variable Costs:
Costs that change with the quantity produced (order situation) or with the sales figures. For example, expenses for:

- Chemicals/Raw materials/Auxiliaries.
- Operating/Production materials.
- Cleaning of reactors (in batch operation).
- Water/Electricity/Other energy carriers or energy converters.
- Packagings.
- Disposal of side products, waste.
- Intermediate storage/Distribution/Transport of hazardous goods.
- Commissions of sales staff (f/m/d).
- Interest rates.

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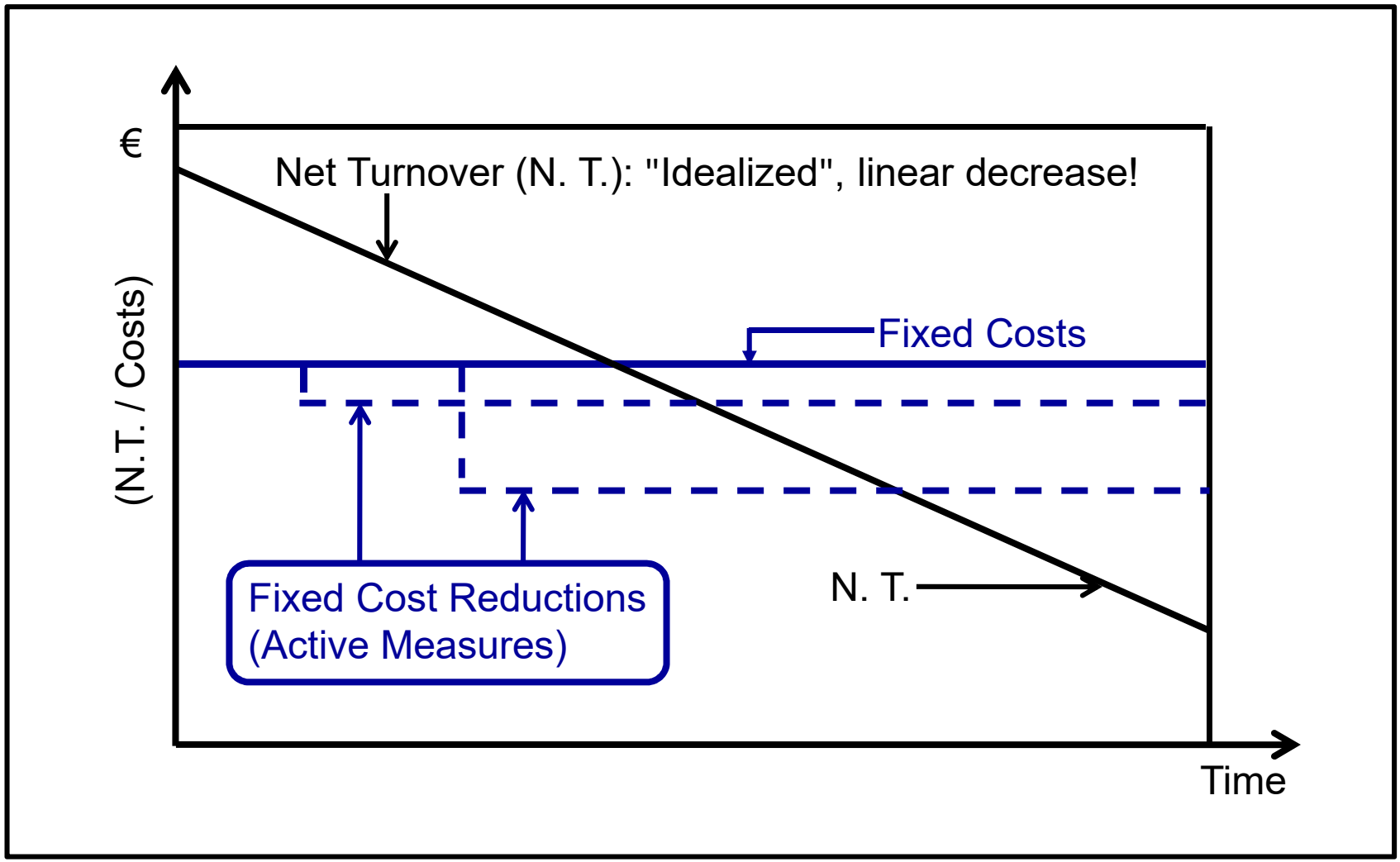
Fixed costs: Costs that are continuous and do not vary with changes in production / sales volumes:

- **Absolutely Fixed Costs:**
  - Personnel costs (Permanent staff).
  - Membership fees (e.g. VCI, ACS, IHK).
  - Periodic insurance expenses, etc.

- **Fixed-Step Costs:**
  - Rental fees for (laboratory) buildings, gas tanks, pipelines, leasing cars, trucks, large size containers, etc.
  - Expenditures for indispensible training measures, etc.

Fixed Costs

These are Independent of the Sales or Turnover Situation!



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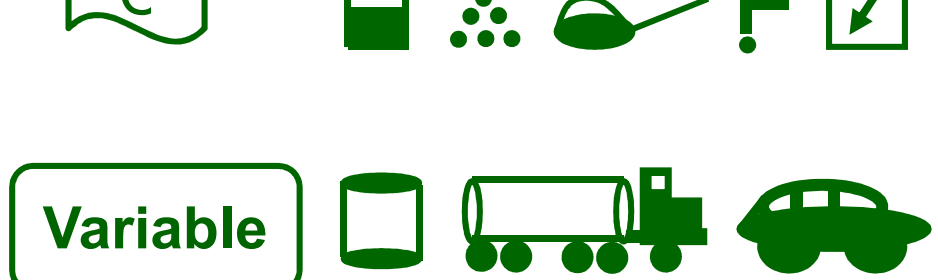
Contribution Margin 1, C. M. I, Definition.

The contribution margin is the difference between the net turnover and the variable costs: C. M. = N. T. − C_v .

The C. M. I for a specific product indicates what remains of the net sales generated with it per defined period of time after its manufacture and sale, if ***all product-specific variable costs*** have been deducted:

E.g. the costs of raw material supplies, the proportional costs for operating and auxiliary materials, energy and water consumption, packaging, transport and, if applicable, the assigned commissions of the sales personnel.

Contribution Margin 1, C. M. I, Basis for Operating Profit, O. P.

NT (product-specific)	€ Net Turnover
– *product-specific* variable costs: raw-, operating materials, water, energy, packa-ging, transport, commissions, etc.	– €  
CM I (product-specific)	€ Contribution Margin 1

The product-specific C. M. I *proportionally* covers all of the company's fixed costs in the period under consideration.

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Contribution Margin 1 (C. M. I):

Example

- Net Turnover (Product) − Variable Costs (Product).

Example Cu-Phthalocyanine:

Net Turnover (N. T.)	€	439.900,00
− Variable Product Costs	€	− 185.000,00
C. M. I	**€**	**254.900,00**
− Proportionated Fixed Costs	€	− 380.000,00
O. R.	**€**	**− 125.100,00**

Contribution Margin 1 (C. M. I):

Example

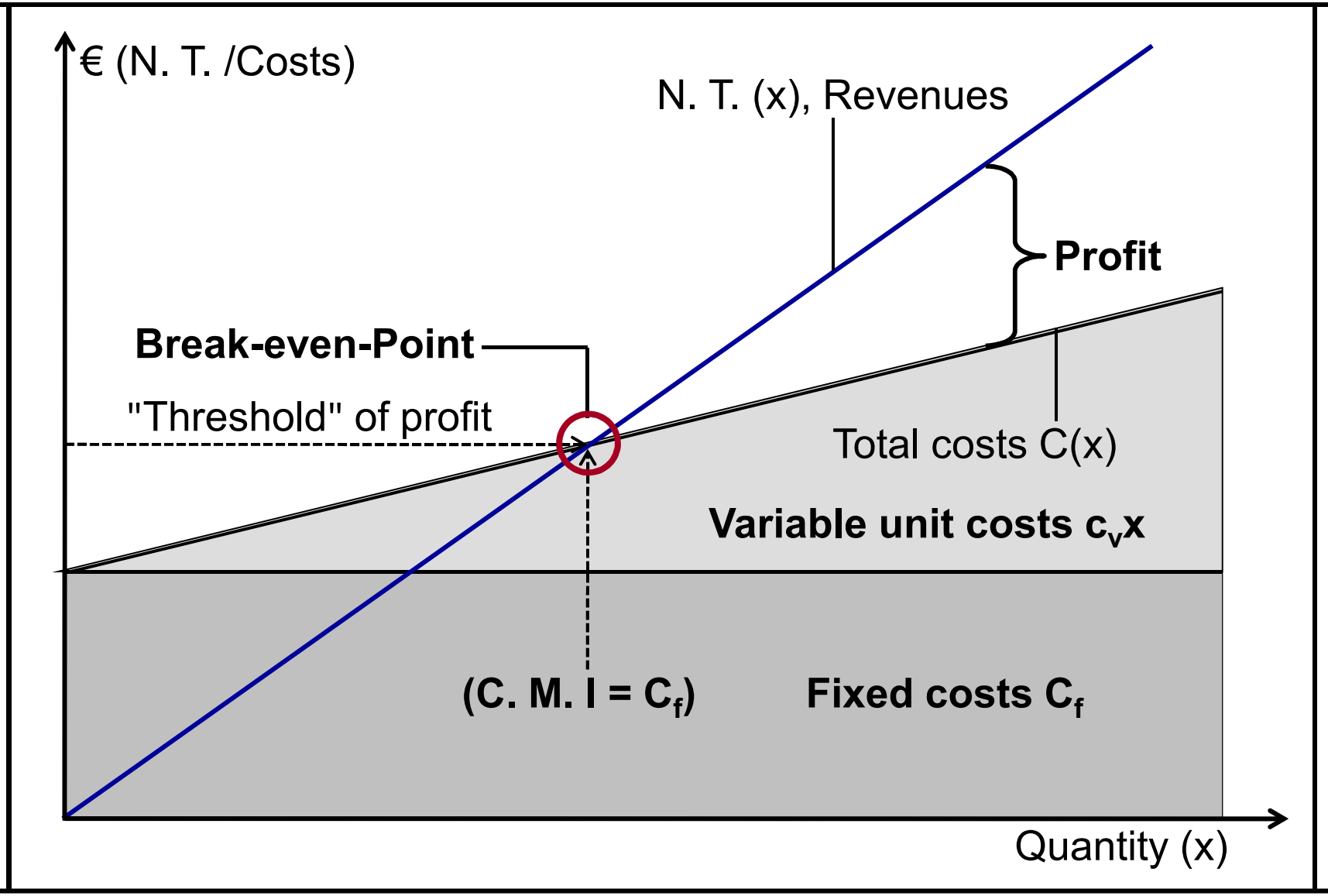
- Net Turnover (Product) − Variable Costs (Product).

Example Cu-Phthalocyanine, **Double Turnover:**

Net Turnover (N. T.)	€	**879.800,00**
− Variable Product Costs	€	− 345.000,00
C. M. I	**€**	**534.800,00**
− Proportionated Fixed Costs	€	− 380.000,00
O. R.	**€**	**154.800,00**

Break-even-Point, "Theshold of Profit".

The functions N. T.(x) and C(x) are "idealized" by their linear forms.



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Break-even-Point, "Threshold" of Profit.

- The break-even point can be calculated for one product ("One product calculation") or for several products ("Multi-product calculation").

- **Net turnover ("Revenue") and costs** of a production (or product) **are equal.** Neither loss nor profit is made.

- At the "threshold" of profit, the **contribution margins** of all sold products **are equal to the fixed costs**.
  If the profit threshold is exceeded, one makes profits, if one falls below it, one makes losses.

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Break-even-Point, "Threshold" of Profit: Calculation, Each with "Idealized" Linear Functions.

$C(x) = c_v x + C_f$

N. T.(x) = px

At the profit "threshold":

$C(x) = N.\ T.(x)$

$c_v x_G + C_f = p x_G$

$C_f = p x_G - c_v x_G = x_G\ (p - c_v)$

$$x_G = \frac{C_f}{p - c_v} = \frac{C_f}{cm}$$

C(x): Cost function

N. T.(x): Net turnover function

c_v: Variable unit costs

C_f: Total fixed costs

p: Price per product unit

x: Production-/Sales volume

x_G: "Contribution quantity" at the profit "threshold".

c.m.: Contribution margin per quantity unit x.

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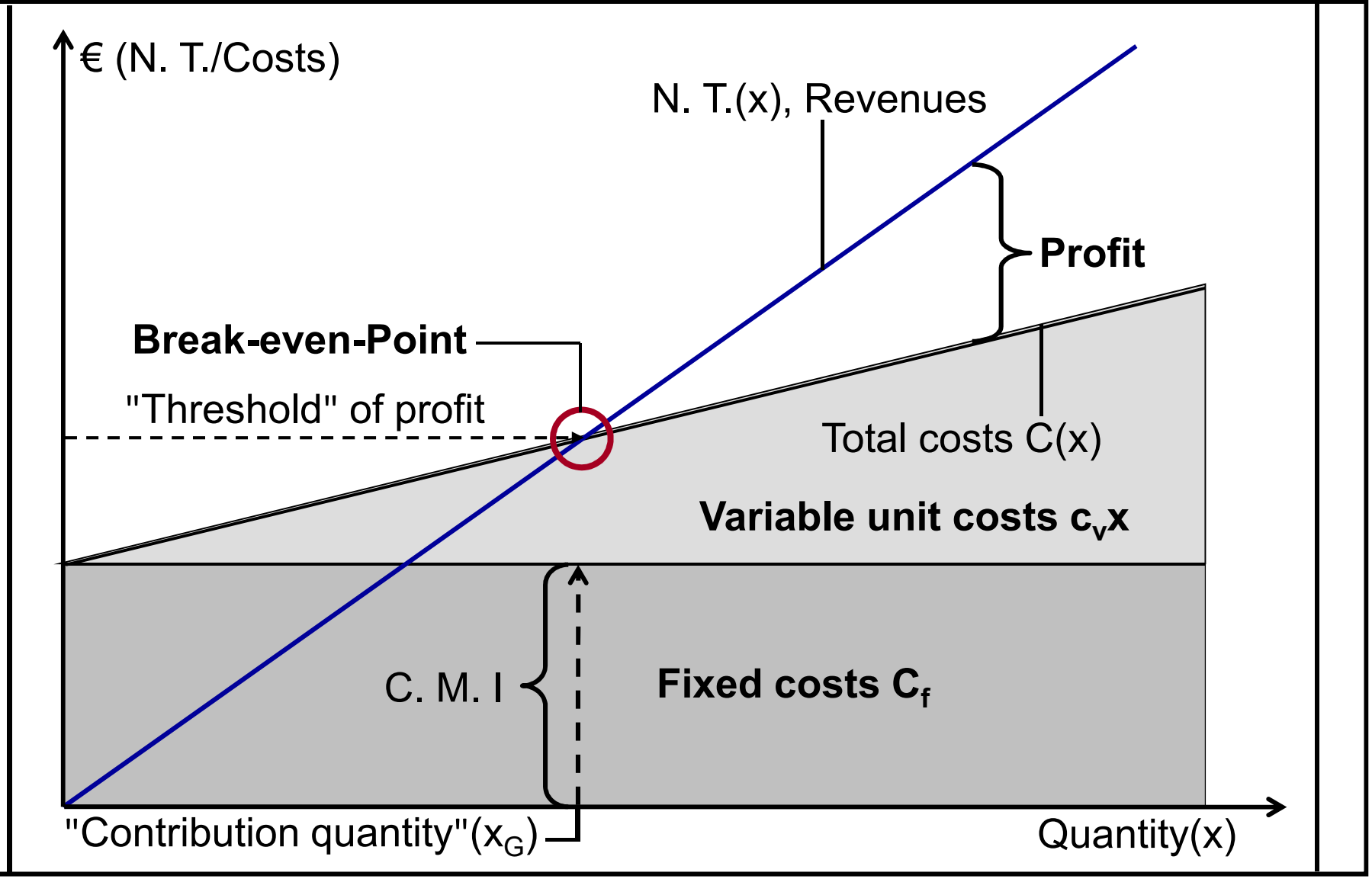
Break-even-Point, "Threshold" of Profit.

The Functions N. T.(x) and C(x) are "Idealized" by their Linear Forms.



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"Threshold" of Profit, Contribition Quantity x_G :

Example: OEM-Automotive Clear Coat.

Automotive Clear Coat, CC-37.45, […GmbH1].

Price, p: 6,20€/l.

Variable Unit Costs, c_v: 2,10€/l.

Contribution Margin c. m.: 4,10€/l.

Proportionated Fixed Costs, C_f: 3.850.000€.

Example

$$x_G = \frac{3.850.000\ €}{4,10\ €/l} = 939.024\ l\ (Litres) \triangleq \text{Contribution Quantity.}$$

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Contribution Margin 2 (Simple 4-Step Profitability Analysis):

CM I (product-specific)

Contribution Margin 1

– *product-specific* fixed costs:

F. S. C.* for product manufacturing, rents for the production a-reas, cleaning costs, etc.

– 

F. S. C.*: Fixed Staff Costs

CM II (product-specific)

Contribution Margin 2

The product-specific C. M. II *proportionally* covers all fixed costs incurred outside the production of this product in the company in the period under consideration.

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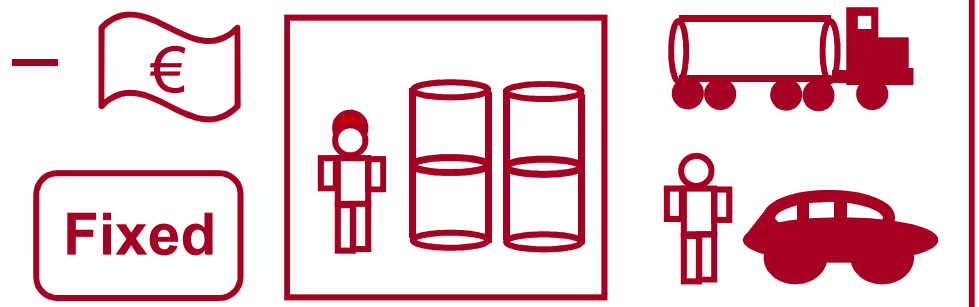
Gross Operating Result (Simple 4-Step Profitability Analysis):

CM II (product-specific)

Contribution Margin 2

– *pro rata product group-specific* fixed costs

from the storage, transport and the distribution, etc.



G.O.R. (product-specific)

Gross Operating Result

The product-specific BBE *proportionally* covers all fixed costs incurred outside of the production, storage, transport and distribution of this product in the company in the period under consideration.

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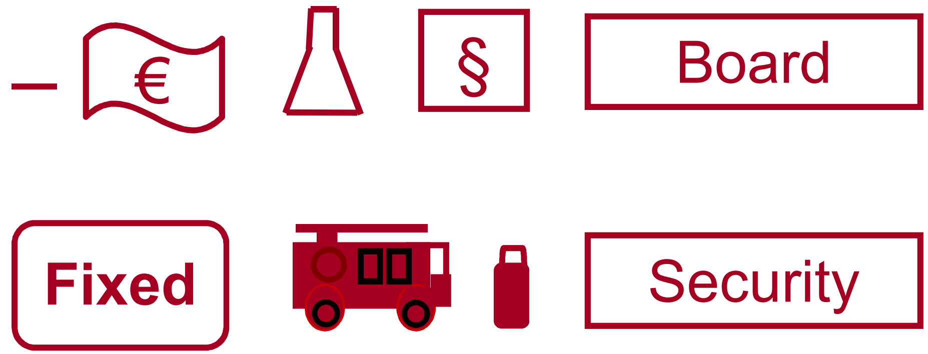
Operating Result, O. R., (Simple 4-Step Profitability Analysis):

GOR (product-specific)	€ Gross Operating Result
– *pro rata remaining fixed costs* of the company ↓ R&D, legal department, security, fire department, etc.	
OR (product-specific)	€ Operating Result

The product-specific O. R. remains for the period under consideration from the net sales of a product after deducting all associated variable and all proportional fixed costs of the company.

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Annual Result Statement of a Paint Company

Example

"[…GmbH 1]" (Jan. 01, 2020 – Dec. 31, 2020)

Sales Volume (Kilogram)	127.838.531
Net Turnover (N. T., €)	*) 941.315.494
− Variable Costs (€)	− 428.861.842
Contribution Margin I (€)	**512.453.652**
− Fixed Production Costs (€)	− 127.545.747
Contribution Margin II (€)	**384.907.905**
− Fixed Sales and Storage Costs (€)	− 198.078.582
Gross Operating Result (€)	**186.829.323**
− Research & Development Costs (€)	− 028.308.650
− Other Fixed Costs (€)	− 107.310.161
Operating Result (Earnings) (€)	**051.210.512**
Profit Margin: 100 x O. R. / N. T. = **5,44%**	*) Ø ≈ 7,36 € / kg Paint

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Five Types of Contribution Margin for Detailed, Multi-Level Contribution Margin Accounting in Segmented Companies:

N. T.	(Related to a specific product)	
	− Product specific variable costs	
C. M. I		
	− Product specific fixed costs	
C. M. II		
	− Pro rata product group-specific fixed costs	
C. M. III		**≍ G.O.R.**
	− Pro rata division-specific fixed costs	
C. M. IV		
	− Pro rata company-specific fixed costs	
C. M. V		**≍ O.R.**
CM I-V: Decision-making basis for product-, cost-, location-policy, etc.		

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Five Types of Contribution Margin for Detailed, Multi-Level Contribution Margin Accounting in Segmented Companies:

	Examples (Selection)
NT	(related to a particular, synthetically manufactured product)
	– Costs for chemicals, solvents, energy, packaging, commissions, ...
CM I	
	– Staff costs for the specific product manufacture and reactor maintenance, ...
CM II	
	– Pro rata rental and personnel costs for product storage and logistics, ...
CM III	
	– Pro rata fixed costs for product development, division controlling, IT, ...
CM IV	
	– Pro rata fixed costs for security, legal department, general admin, …
CM V	

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Innovations: Characteristic "Economic Success"

(Law of Taxation: Tax Depreciation (By Wear and Tear, AfA)

Material Depreciation, Definition: →

Decrease in Value of Economic Goods (e.g. Reactors, Analysis Equipment, Buildings, etc.) through their Use/Application.

Example

Example: GC-MS equipment, complete.

Original value: € 48.600,00; Physical life: 12 years.

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Forms of Depreciation:

- **Linear Depreciation (Equal annual rates):**

$$\frac{\text{Initial investment}}{\text{Years of use (Number)}} = \frac{€\ 48.600{,}00}{12} = €\ 4.050{,}00$$

- **Degressive Depreciation (Step by step diminished annual rates):**

Example

Glass reactor for the pilot plant, fully equipped.
Original value: € 360.000,00; Effective life: 7 years.

Scaling of the decrease: 7+6+5+4+3+2+1=28

1. Year	7/28	€ 90.000,00	5. Year	3/28	€ 38.571,00
2. Year	6/28	€ 77.143,00	6. Year	2/28	€ 25.714,00
3. Year	5/28	€ 64.286,00	7. Year	1/28	€ 12.857,00
4. Year	4/28	€ 51.429,00	Σ	**28/28**	**€ 360.000,00**

Forms of Depreciation:

- **Progressive Depreciation**
  (Step by step increased annual rates).

Ore mine for the production of the mineral "Columbit",
Mixture from (Fe, Mn)$(NbO_3)_2$ and (Fe, Mn)$(TaO_3)_2$.
Value after commissioning: $ 180.000.000.
Economic lifetime: 9 Years.

Example

Scaling of the increase: 1+2+3+4+5+6+7+8+9=45

1. Jahr	1/45	$ 4.000.000	6. Jahr	6/45	$ 24.000.000
2. Jahr	2/45	$ 8.000.000	7. Jahr	7/45	$ 28.000.000
3. Jahr	3/45	$ 12.000.000	8. Jahr	8/45	$ 32.000.000
4. Jahr	4/45	$ 16.000.000	9. Jahr	9/45	$ 36.000.000
5. Jahr	5/45	$ 20.000.000	Σ	**45/45**	**$ 180.000.000**

Forms of Depreciation:

- **Service Output Method of Depreciation**
  (Annually Fluctuating Output-Performances).

Tank truck for the distribution of butyl glycol.
Purchase price: € 160.000,00.
Total driving performance: 1 Mio. kilometers.
AfA per kilometer: € 0,16.

Example

1. Year	100.000 km	€ 16.000,00
2. Year	40.000 km	€ 06.400,00
3. Year	220.000 km	€ 35.200,00

Innovations: Characteristic "Economic Success"

Income from Operations before Interest, Taxes, Depreciation and Amortization: EBITDA.

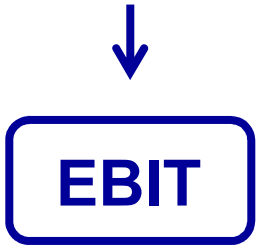
Earnings **B**efore **I**nterest, **T**axes, **D**epreciation and **A**mortization

EBITDA, Definition:

Operating income **before interest** (i.e. before the financial results, consisting of interest income, e.g. by securities and − mainly − interest expenses for the implementation of the operating business), **income taxes** (trade tax and corporation income tax), **depreciation** (tangible assets) **and amortization** (intangible assets, e.g. "goodwill expenses" as parts of M & A, costs for consultancy services, etc.).

Innovations: Characteristic "Economic Success"

EBITDA − (Depreciation / Amortization)
EBITDA − (Losses in Tangible and Intangible Values)



EBIT, Definition:

Earnings **B**efore **I**nterest and **T**axes.

Operating income before the financial income (interest) and income taxes; Result of operating activities.

Innovations: Characteristic "Economic Success"

Company Key Figures; Notice to the Comparison of Corresponding Figures from Different Years:

A direct comparison of company key figures from *different* years is only of limited informative value due to the different balance sheet totals.

Annually different balance sheet totals result, for example, from business combinations, the sale of assets and liabilities, as well as from discontinued operations.

BASF Group: Sales and Earnings 2020 → (IFRS)/(IAS)

Sales	59.149.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	6.494.000.000 €
Income from operations **(EBIT)**	− 191.000.000 €
Income from operations (EBIT) as percentage of sales	− 0,32%
Result after taxes	− 1.075.000.000 €
Result after taxes as percentage of sales	− 1,82%
Dividend per share	3,30 €
Number of shares, December 31, 2020	918.478.694

Depreciation and Amortization:

6.685.000.000 €

Example

Source (Basic Figures): BASF Online Report

2020

BASF Group: Sales and Earnings 2019 → (IFRS)/(IAS)

Sales	59.316.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	8.036.000.000 €
Income from operations **(EBIT)**	4.052.000.000 €
Income from operations (EBIT) as percentage of sales	6,8%
Result after taxes	4.979.000.000 €
Result after taxes as percentage of sales	14,3%
Dividend per share	3,30 €
Number of shares, December 31, 2019	918.478.694

Depreciation and Amortization:

3.984.000.000 €

Example

Source (Basic Figures): BASF Online Report

2019

BASF Group: Sales and Earnings 2018 → (IFRS)/(IAS)

Sales	62.675.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	9.166.000.000 €
Income from operations **(EBIT)**	6.033.000.000 €
Income from operations (EBIT) as percentage of sales	9,6%
Result after taxes	4.979.000.000 €
Result after taxes as percentage of sales	7,9%
Dividend per share	3,20 €
Number of shares, December 31, 2018	918.478.694

Depreciation and Amortization:

3.133.000.000 €

Example

Source (Basic Figures): BASF Online Report

2018

BASF Group: Sales and Earnings 2017 → (IFRS)/(IAS)

Sales	64.475.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	12.724.000.000 €
Income from operations **(EBIT)**	8.522.000.000 €
Income from operations (EBIT) as percentage of sales	13,2%
Result after taxes	6.352.000.000 €
Result after taxes as percentage of sales	9,9%
Dividend per share	3,10 €
Number of shares, December 31, 2017	918.478.694

Depreciation and Amortization:

4.202.000.000 €

Example

Source (Basic Figures): BASF Online Report

2017

BASF Group: Sales and Earnings 2016 → (IFRS)/(IAS)

Sales	57.550.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	10.526.000.000 €
Income from operations **(EBIT)**	6.275.000.000 €
Income from operations (EBIT) as percentage of sales	10,9%
Result after taxes	4.255.000.000 €
Result after taxes as percentage of sales	7,4%
Dividend per share	3,00 €
Number of shares, December 31, 2016	918.478.694

Depreciation and Amortization:

4.251.000.000 €

Example

Source (Basic Figures): BASF Online Report

2016

BASF Group: Sales and Earnings 2015 → (IFRS)/(IAS)

Sales	70.449000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	10.649.000.000 €
Income from operations **(EBIT)**	6.248.000.000 €
Income from operations (EBIT) as percentage of sales	8,9%
Result after taxes	4.301.000.000 €
Result after taxes as percentage of sales	6,1%
Dividend per share	2,90 €
Number of shares, December 31, 2015	918.478.694

Depreciation and Amortization:

4.401.000.000 €

Example

Source (Basic Figures): BASF Online Report

2015

BASF Group: Sales and Earnings 2014 → (IFRS)/(IAS)

Sales	74.326000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	11.043.000.000 €
Income from operations **(EBIT)**	7.626.000.000 €
Income from operations (EBIT) as percentage of sales	10,3%
Result after taxes	5.492.000.000 €
Result after taxes as percentage of sales	7,4%
Dividend per share	2,80 €
Number of shares, December 31, 2014	918.478.694

Depreciation and Amortization:

3.417.000.000 €

Example

Source (Basic Figures): BASF Online Report

2014

BASF Group: Sales and Earnings 2013 → (IFRS)/(IAS)

Sales	73.973.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	10.427.000.000 €
Income from operations **(EBIT)**	7.273.000.000 €
Income from operations (EBIT) as percentage of sales	9,8%
Result after taxes	4.842.000.000 €
Result after taxes as percentage of sales	6,5%
Dividend per share	2,70 €
Number of shares, December 31, 2013	918.478.694

Depreciation and Amortization:

3.154.000.000 €

Example

Source (Basic Figures): BASF Online Report

2013

BASF Group: Sales and Earnings 2012 → (IFRS)

Sales	78.729.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	12.516.000.000 €
Income from operations **(EBIT)**	8.976.000.000 €
Income from operations (EBIT) as percentage of sales	11,4%
Result after taxes	4.879.000.000 €
Result after taxes as percentage of sales	6,2%
Dividend per share	2,60 €
Number of shares, December 31, 2012	918.478.694

Depreciation and Amortization:

3.540.000.000 €

Example

Source (Basic Figures): BASF Online Report

2012

BASF Group: Sales and Earnings 2011 → (IFRS)

Sales	73.497.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	11.993.000.000 €
Income from operations **(EBIT)**	8.586.000.000 €
Income from operations (EBIT) as percentage of sales	11,7%
Result after taxes	6.188.000.000 €
Result after taxes as percentage of sales	8,4%
Dividend per share	2,50 €
Number of shares, December 31, 2011	918.478.694

Depreciation and Amortization:

3.407.000.000 €

Example

Source (Basic Figures): BASF Online Report

2011

BASF Group: Sales and Earnings 2010 → (IFRS)

Sales	63.873.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	11.131.000.000 €
Income from operations **(EBIT)**	7.761.000.000 €
Income from operations (EBIT) as percentage of sales	12,2%
Result after taxes	4.557.000.000 €
Result after taxes as percentage of sales	7,1%
Dividend per share	2,20 €
Number of shares, December 31, 2010	918.478.694

Depreciation and Amortization:

3.370.000.000 €

Example

Source (Basic Figures): BASF Online Report

2010

BASF Group: Sales and Earnings 2009 → (IFRS)

Sales	50.693.000.000 €
Income from operations before depreciation and amortization **(EBITDA)**	7.388.000.000 €
Income from operations **(EBIT)**	3.677.000.000 €
Income from operations (EBIT) as percentage of sales	7,3%
Result after taxes	1.410.000.000 €
Result after taxes as percentage of sales	2,8%
Dividend per share	1,70 €
Number of shares, December 31, 2009	918.478.694

Depreciation and Amortization:

3.711.000.000 €

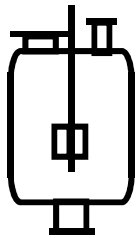
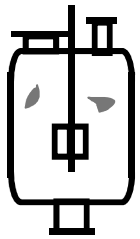
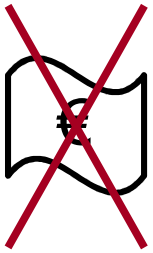
Example

Source (Basic Figures): BASF Online Report

2009

Depreciation by Wear and Tear

Economic Lifetime: 20 Years, with Linear Depreciation.

300.000 € (Value as New)		→	 01.01.2010
300.000 € − n x 15.000 € (Residual Value)		→	 01.01.2010+n
300.000 € − 20 x 15.000 € (0€, Scrap Value)		→	 01.01.2030

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Innovations: Characteristic "Economic Success"

Cashflow („Movement of Money“) from Operating Activities

EBITDA
+ Depreciation/Amortization (*Decreases* in value)
− Taxes ± Interest
± Long-term provisions
± Gain/Loss on the sale of tangible fixed assets
± „Working Capital“ *)
*) (Δ Current assets and short-term liabilities)

→ "Clear" key figure for the profitability of a company as a result of its operational activities: **Excess of payments-in over payments-out!**

Innovations: Characteristic "Economic Success"

Cashflow („Movement of Money“) from Operating Activities

EBIT (Earnings before Interest and Taxes)
− Taxes ± Interest
± Long-term provisions
± Gain/Loss on the sale of tangible fixed assets
± „Working Capital“ *)
*) (Δ Current assets and short-term liabilities)

→ "Clear" key figure for the profitability of a company as a result of its operational activities: **Excess of payments-in over payments-out!**

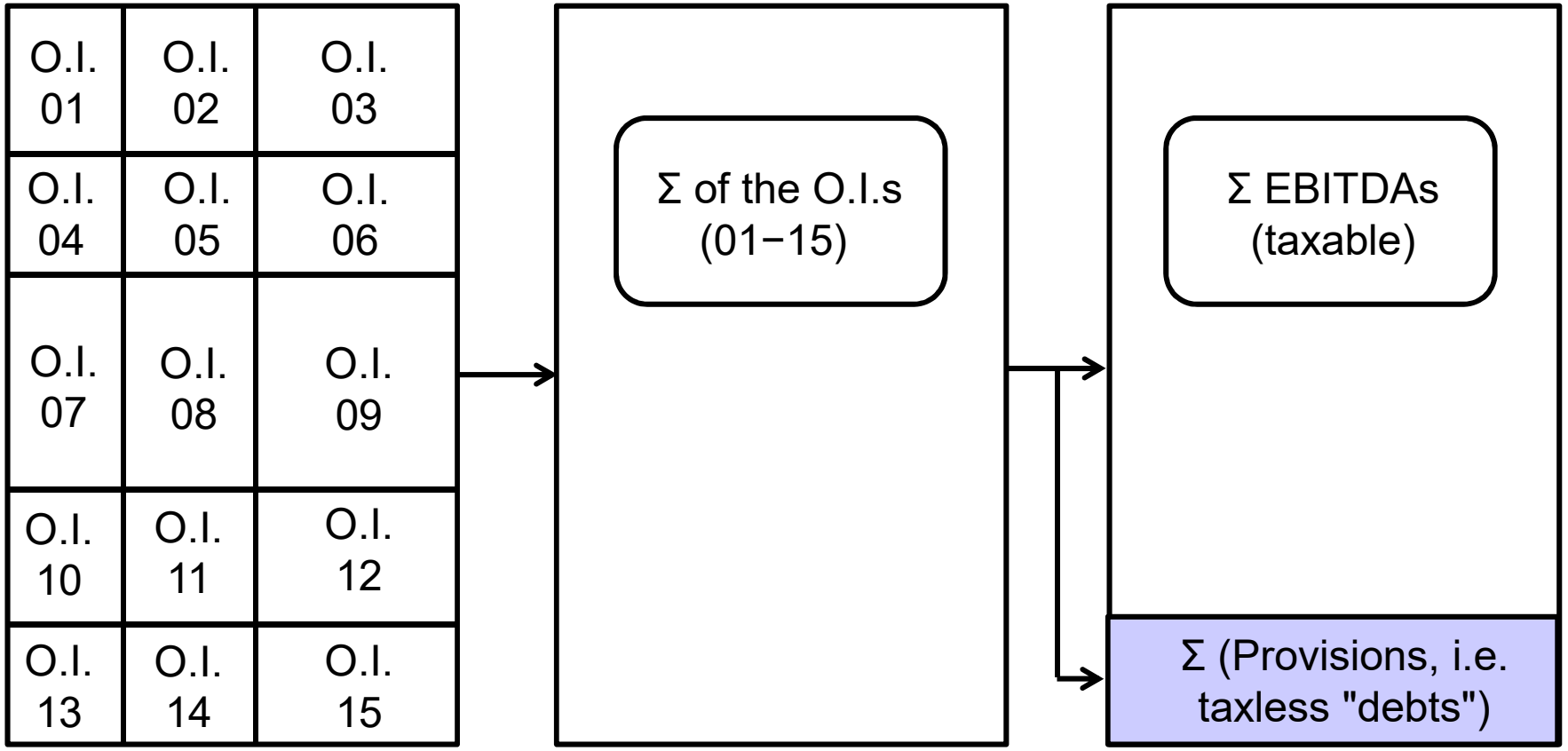
Taxes, Company-Linked Taxes:

→ **Corporate Income Tax:** *Income-related* tax on corporations. Tax rate (D) 15%.

→ **Trade Tax:** *Income-related tax*, which is demanded by each municipality (city) from the companies operating there (via "assessment rate", "collection rate"). Order of magnitude (D): Approximately 15%.

→ **Other Taxes:** Taxes incurred automatically for a company. Examples: Real property taxes, car taxes for company cars (Customer service, delivery vans, pick-up trucks!), insurance taxes for production equipment, etc.

Σ of Operating Income (O.I.): 15 Factories, Σ of Provisions.



EBITDA: Earnings Before Interest, Taxes, Depreciation and Amortization.

Provisions are "debts" (Future financial commitments) against third parties.
Therefore, these are not to be taxed!

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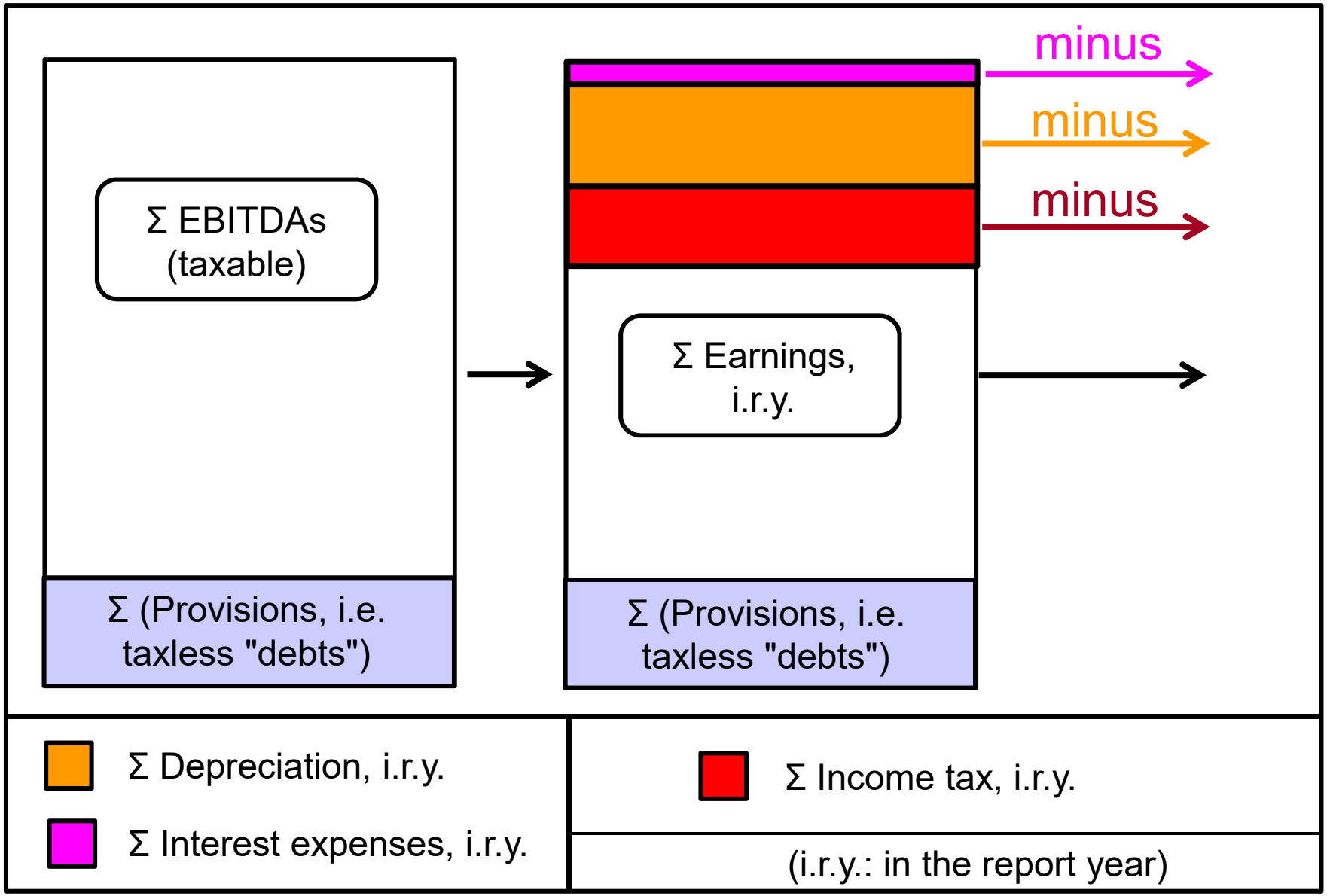
Σ of Operating Incomes, Σ Deductions ("Losses").



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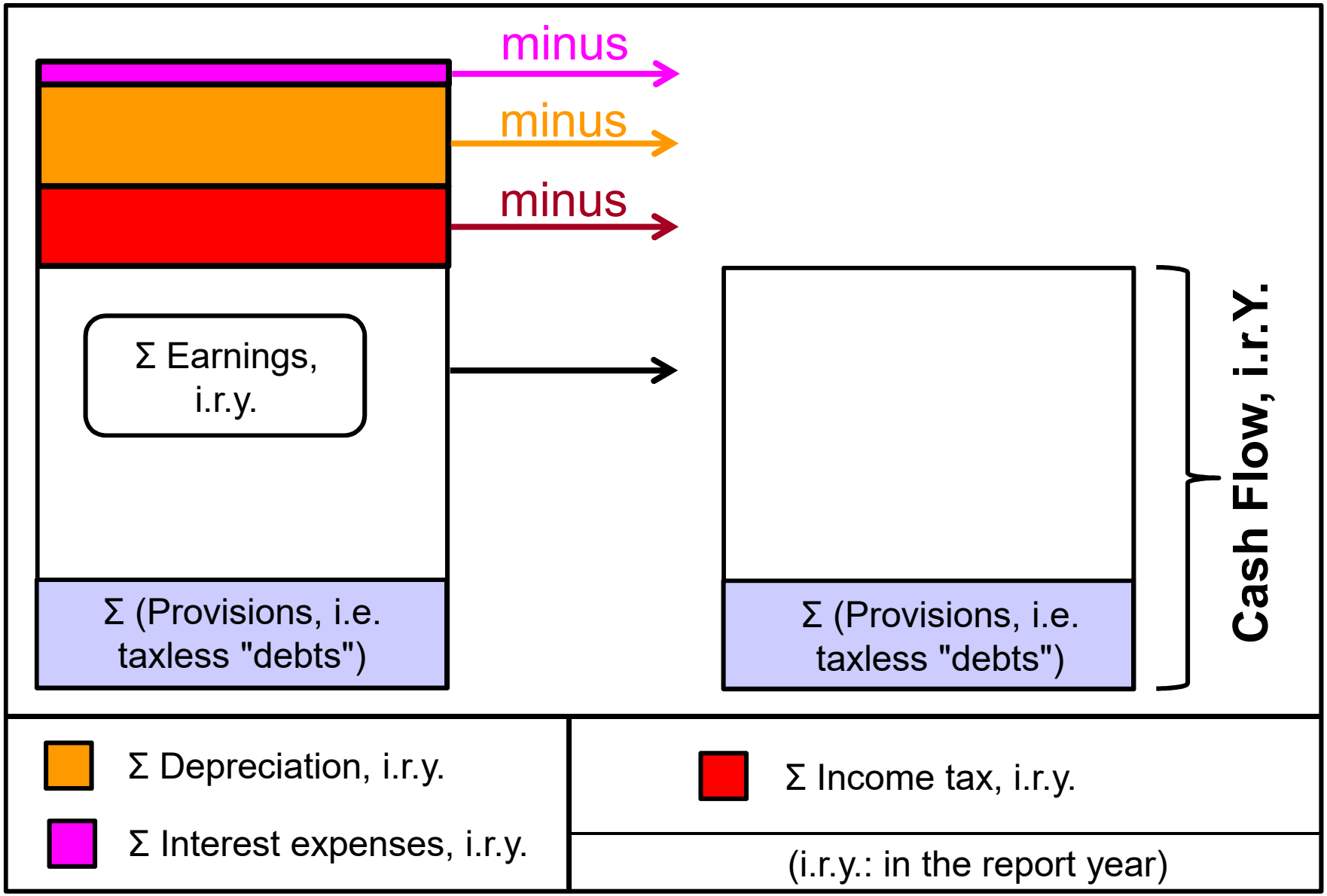
Cash Flow, Explanation:



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BASF Goup: Cashflow 2020 → (IFRS)/(IAS)

Sales	59.149.000.000 €
EBIT	− 191.000.000 €
Cashflows from operating activities	**5.413.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

\+ 5.604.000.000 €

\+ 487.000.000 €
\+ 5.117.000.000 €

\+ 5.604.000.000 €

Source (Basic Figures):
BASF Online Report
2020

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BASF Goup: Cashflow 2019 → (IFRS)/(IAS)

Sales	59.316.000.000 €
EBIT	4.052.000.000 €
Cashflows from operating activities	**7.474.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

\+ 3.422.000.000 €

− 756.000.000 €
\+ 4.178.000.000 €
\+ 3.422.000.000 €

Source (Basic Figures):
BASF Online Report
2019

BASF Goup: Cashflow 2018 → (IFRS)/(IAS)

Sales	62.675.000.000 €
EBIT	6.033.000.000 €
Cashflows from operating activities	**7.939.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

\+ 1.906.000.000 €

− 1.138.000.000 €
\+ 3.044.000.000 €

\+ 1.906.000.000 €

Source (Basic Figures):
BASF Online Report
2018

BASF Goup: Cashflow 2017 → (IFRS)/(IAS)

Sales	64.475.000.000 €
EBIT	8.522.000.000 €
Cashflows from operating activities	**8.785.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

\+ 263.000.000 €

− 1.448.000.000 €
\+ 1.711.000.000 €

\+ 263.000.000 €

Source (Basic Figures):
BASF Online Report

2017

BASF Goup: Cashflow 2016 → (IFRS)/(IAS)

Sales	57.550.000.000 €
EBIT	6.275.000.000 €
Cashflows from operating activities	**7.717.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

\+ 1.442.000.000 €

− 1.140.000.000 €
\+ 2.582.000.000 €

\+ 1.442.000.000 €

Source (Basic Figures):
BASF Online Report

2016

BASF Goup: Cashflow 2015 → (IFRS)/(IAS)

Sales	70.449.000.000 €
EBIT	6.248.000.000 €
Cashflows from operating activities	**9.446.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

\+ 3.198.000.000 €

− 1.558.000.000 €
\+ 4.756.000.000 €

\+ 3.198.000.000 €

Source (Basic Figures):
BASF Online Report
2015

BASF Goup: Cashflow 2014 → (IFRS)/(IAS)

Sales	74.326.000.000 €
EBIT	7.626.000.000 €
Cashflows from operating activities	**6.958.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

− 668.000.000 €

− 1.711.000.000 €
+ 1.043.000.000 €

− 668.000.000 €

Source (Basic Figures):
BASF Online Report

2014

BASF Goup: Cashflow 2013 → (IFRS)/(IAS)

Sales	73.973.000.000 €
EBIT	7.273.000.000 €
Cashflows from operating activities	**7.870.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

\+ 597.000.000 €

− 1.871.000.000 €
\+ 2.468.000.000 €

\+ 597.000.000 €

Source (Basic Figures):
BASF Online Report
2013

BASF Goup: Cashflow 2012 → (IFRS)/(IAS)

Sales	78.729.000.000 €
EBIT	8.976.000.000 €
Cashflows from operating activities	**6.733.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

− 2.243.000.000 €

− 4.097.000.000 €
+ 1.854.000.000 €

− 2.243.000.000 €

Source (Basic Figures):
BASF Online Report

2012

BASF Goup: Cashflow 2011 → (IFRS)/(IAS)

Sales	73.497.000.000 €
EBIT	8.586.000.000 €
Cashflows from operating activities	**7.105.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

− 1.481.000.000 €

− 2.398.000.000 €
+ 917.000.000 €

− 1.481.000.000 €

Source (Basic Figures):
BASF Online Report
2011

BASF Goup: Cashflow 2010 → (IFRS)/(IAS)

Sales	63.873.000.000 €
EBIT	7.761.000.000 €
Cashflows from operating activities	**6.460.000.000 €**

Source (Basic Figures):
BASF Online Report
2010

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

− 1.301.000.000 €

− 3.204.000.000 €
+ 1.903.000.000 €
− 1.301.000.000 €

BASF Goup: Cashflow 2009 → (IFRS)/(IAS)

Sales	50.693.000.000 €
EBIT	3.677.000.000 €
Cashflows from operating activities	**6.270.000.000 €**

Example

− Taxes
+/− Interest
+/− Provisions
+/− Fixed Assets
+/− Working Capital

\+ 2.593.000.000 €

− 2.267.000.000 €
\+ 4.860.000.000 €

\+ 2.593.000.000 €

Source (Basic Figures):
BASF Online Report
2009

Provisions, Types of Provisions:

Provisions ("Principle of Precaution by Merchants").

Capital for foreseeable, anticipated obligations to pay, the respective amounts and maturities of which are not yet certain.
These are exempt from trade tax and corporation tax.
Prerequisite: The probability of a payment must be> 50% (IFRS).

Examples

- Company Pension Reserves.
- Provisions for Taxation.
- Provisions for Impending Losses.
- Provisions for Goodwill/Warranties.
- Provisions for Processes (Only for pending processes!).
- Provisions for Expenditures/Restoration/Maintainance.

Reserves, Types of Reserves.

Reserves, Retained Earnings.

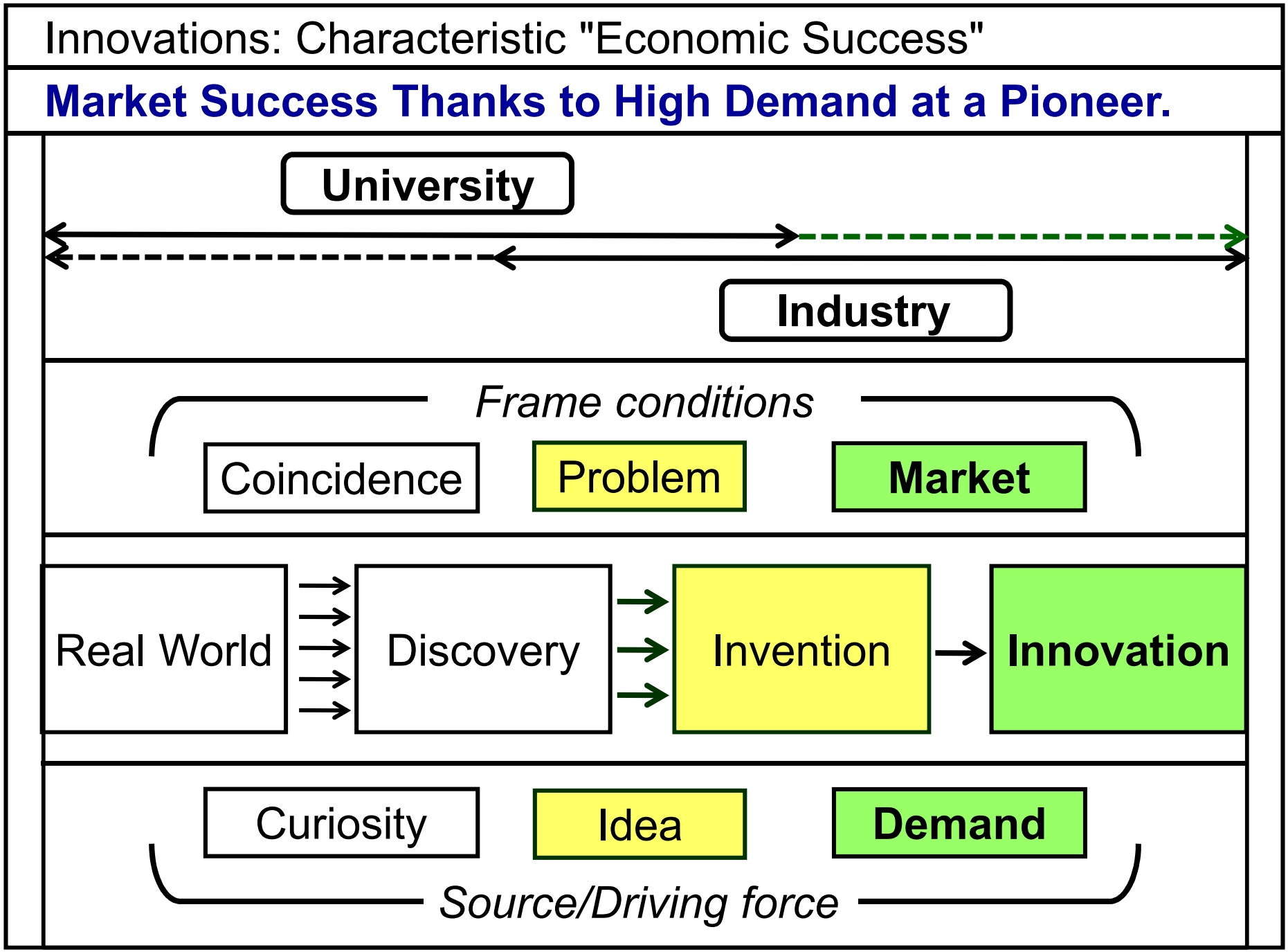
These funds are shown in the balance sheet as part of equity:
Proportion of own funds for the invested capital.

Examples

- Statutory reserves (Risik provision, creditor protection).
- Free reserves (Enterprise protection, substance preservation, self-financing, etc.).
- Hidden reserves (These are not disclosed in the balance sheet. According to the IFRS, hidden reserves are widely excluded today!).

Innovations: Characteristic "Economic Success"

Market Success Thanks to High Demand at a Pioneer.



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Innovations: Characteristic "Economic Success"

Market Success Thanks to High Demand at a "Pioneer". Successful Market Launch.

Key: ⟶ Customer Orientation

- R&D Cooperations with competent customers.
- Target definitions together with the customers.
- Mutually prepared market studies.
- Integration of sales/purchasing units.
- Project planning/Controlling with the customers.
- Active support from the management.

Innovations: Characteristic "Economic Success"

Successful Market Launch!

→ **! Marketing Concept !**

In Focus: **Customer View, Customer Requirements.**

Instrument: Effective Integrated Marketing.
Goal: Sustainable results through customer satisfaction.

→ **? Concept of Selling ?**

In Focus: **The Own Product; The Own Offers.**

Instrument: Product Advertising / Sales Increases.
Goal: Short-term results due to high sales.

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Innovations: Characteristic "Economic Success"

Customer Orientation: Key to Success!

The three most important questions are

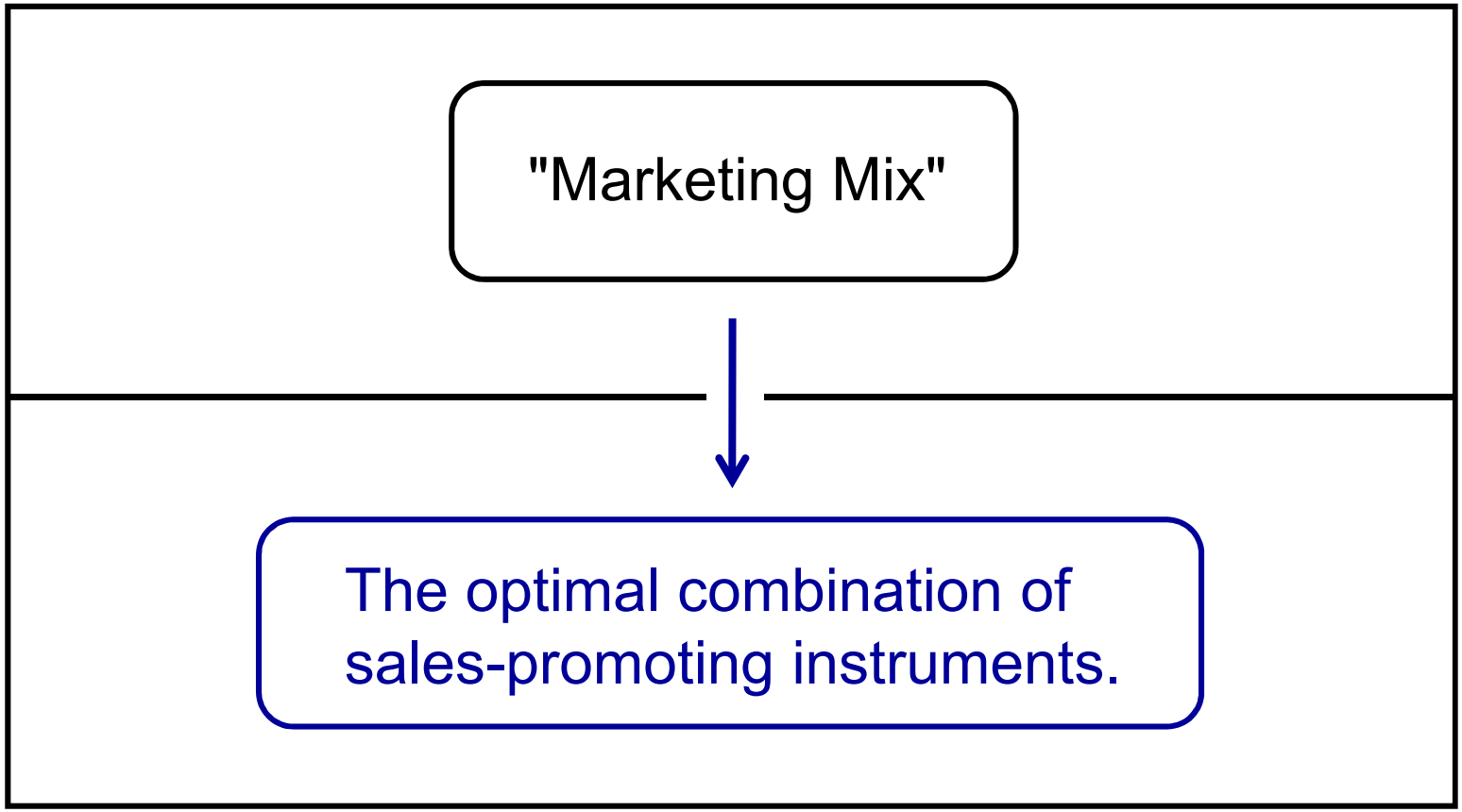
- → What is our business?
- → Who are our (future) customers?
- → What does the customer consider valuable?

Goal-oriented project management **(Management by Objectives)** works if you **answer these questions at *first*!**

(According to Peter F. Drucker)

Innovations: Characteristic "Economic Success"

Marketing Policy, Control Instruments:



Innovations: Characteristic "Economic Success"

Marketing Policy, Control Instruments.

"Marketing Mix" (The "four crosslinked P")

- Product Policy (**P**roduct, $\mathbf{P_1}$)
- Pricing Policy (**P**rice, $\mathbf{P_2}$)
- Communication Policy (**P**romotion, $\mathbf{P_3}$)
- Distribution Policy (**P**lace, $\mathbf{P_4}$)

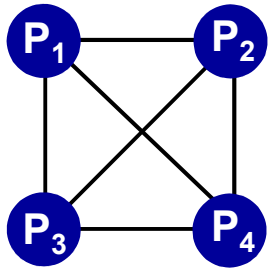
"Marketing Mix"

→ Target- and result-oriented focus of the products and operations on the customer's wishes and on the market opportunities.

Innovations: Characteristic "Economic Success"

Marketing Policy, Control Instruments.

"Marketing Mix" (The "four crosslinked P")



"Marketing Mix"

K_4 - Graph $\begin{bmatrix} 4 \\ 2 \end{bmatrix}$

P_1	Product Policy
P_2	Pricing Policy
P_3	Communikation Policy
P_4	Distribution Policy

→ Target- and result-oriented focus of the products and operations on the customer's wishes and on the market opportunities.

Innovations: Characteristic "Economic Success"

Marketing Policy, Control Instruments:

Product Policy, P_1:

- Product Innovation, Degree of Innovation ("Pioneer Product").
- Product Applications, Product Benefit.
- Product Quality (e.g. Purity of a Chemical).
- Assortment-Design (e.g. Insecticides, Herbicides, Fungicides, Bioregulators and Fertilizers in Agro Sortiment).
- Customer Service for "Products Requiring Explanation" (e.g. Control of the Paint Process on Site).

Pricing Policy, P_2:

- Sales Price Setting.
- Discounts, Payback- and Bonussystems.
- Agreed Terms of Payment.

Innovations: Characteristic "Economic Success"

Marketing Policy, Control Instruments:

Communication Policy, P_3:

- Advertising (Consumer Products, e.g. Cosmetics).
- Product Information: Brochures, Internet//WWW.
- Sales Promotion (e.g. Sample Dyeing on Site).
- Public Relations (e.g. Published Eco-Efficiency Analyses).

Distribution Policy, P_4:

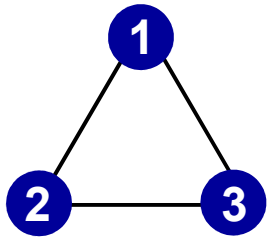
- Distributive Channels (Place of Production - Storage Site - Delivery Address - Intermediate Trade or Direct Selling).
- Sales Organization (e.g. via e-Commerce).
- Logistics of Distribution (Means of Transportation, Routes).
- Central Warehouse, Automated Delivery, Regional Distributors.

Innovations: Characteristic "Economic Success"

Market Research, Indispensable Sources of information:

Key Sales Market →

1	Customer Requirements
2	Offers from the Competitors
3	Own Offer



Market Research:

The systematic collection, processing and interpretation of data about markets, customers, competitors and the conclusions drawn from it.

$$(K_3): \begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

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Innovations: Characteristic "Economic Success"

Market Research, Critical Factors for Success.

Indispensable Survey Factors

↓

- Identified key trends (markets and current events).
- Analysis of the wishes and motives of customers to buy.
- Inquiries about the respective customer satisfaction.
- Investigation of the effectiveness of "advertising media".
- Monitoring of the competition and competitive activities.
- Knowledge of the acceptance of innovations (product/service).
- Evaluation of one's own market position.

Innovations: Characteristic "Economic Success"

Seller's Market and Buyer's Market:

Description	**Seller`s Market**
Economy Characteristics	Scarce Economy
Ratio of Supply and Demand	**Supply < Demand** Excess in Demand: Demanders are more active than suppliers.
Bottleneck area in the own company	Procurement processes and/or production capacity.
Primary efforts of the innovators	Expansion of production capacity. Modernization of own facilities. Automation, robotics.

Innovations: Characteristic "Economic Success"

Seller's Market and Buyer's Market:

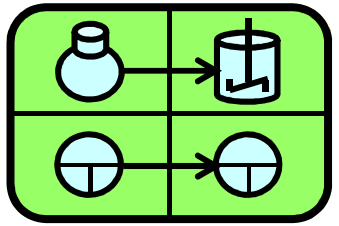
Description	**Buyer`s Market**
Economy Characteristics	Market Saturation
Ratio of Supply and Demand	**Supply > Demand** Excess in Supply: Suppliers are more active than demanders.
Bottleneck area in the own company	Sales Volume.
Primary efforts of the innovators	Increase of demand through active advertisement for the own, better offer.

Innovations: Characteristic "Economic Success"

Product Innovations, Market Positioning:

Demand / ***Competition***	**strong**	***weak***
strong	**Mass Markets** High sales. Global competition. Strong competition. Global offer.	**Shrinking Markets** Overcapacity. Small profit margins. Falling turnovers. (High) Losses**.**
weak	**Future Markets** Urgent need. Missing chemical-technical solutions. Only a few approaches to problem solving.	**Niche Markets** Highly specific needs. Small sales. High profit margins.

R&D Project Management
in the Chemical Industry



Information Material *for the Subject Matters:*
Innovation, Market Allocation

See Supplement Module 3 for Chemists (m/f/d)

"Deep Drawing-Stable Epoxy-Coating for the Protection of Tin Cans."

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Innovations: Characteristic "Economic Success"

Balance, Origin of the Word:

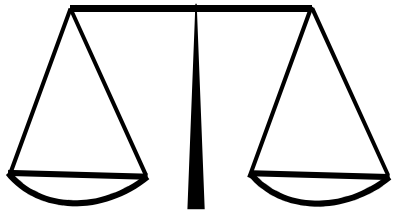
Italian: Bilancia, the Scales.

Latin: Bilanx, the Pair of Balances.

1494 → Luca Pacioli, Franciscan Friar.

The Venetian Method:

Double-Entry Bookkeeping →



Main Work: "Summa de Arithmetica, Geometrica, Proportioni et Proportionalita".

Innovations: Characteristic "Economic Success"

The Double-Entry Bookkeeping After Pacioli (1445-1517).

	Luca Pacioli, Mathematician and Monk
1445	Born in Borge San Sepolcro, Toscana.
1477	Professor at Perugia, Rom, Neapel, Pisa,…
1494	"Summa de Arithmetica, Geometrica…"
1500	"De Ludo Scacchorum", together with his pupil Leonardo da Vinci.
1509	Treatise on the "Goldenen Section", together with Leonardo da Vinci "De Divina Proportione" (Venice).

Innovations: Characteristic "Economic Success"

The Balance Sheet Always has Two Sides:

Assets (Net Worth, Investment)	**Equity/Liabilities** (Capital, Financing)
Use of Funds	*Source of Funds*
Example Purchase of a destilling column **€ 120.000,00**	**Example** Credit from a financial institute **€ 120.000,00**

Balance Sheet Equation

Σ € (Assets) = Σ € (Equity/Liabilities)

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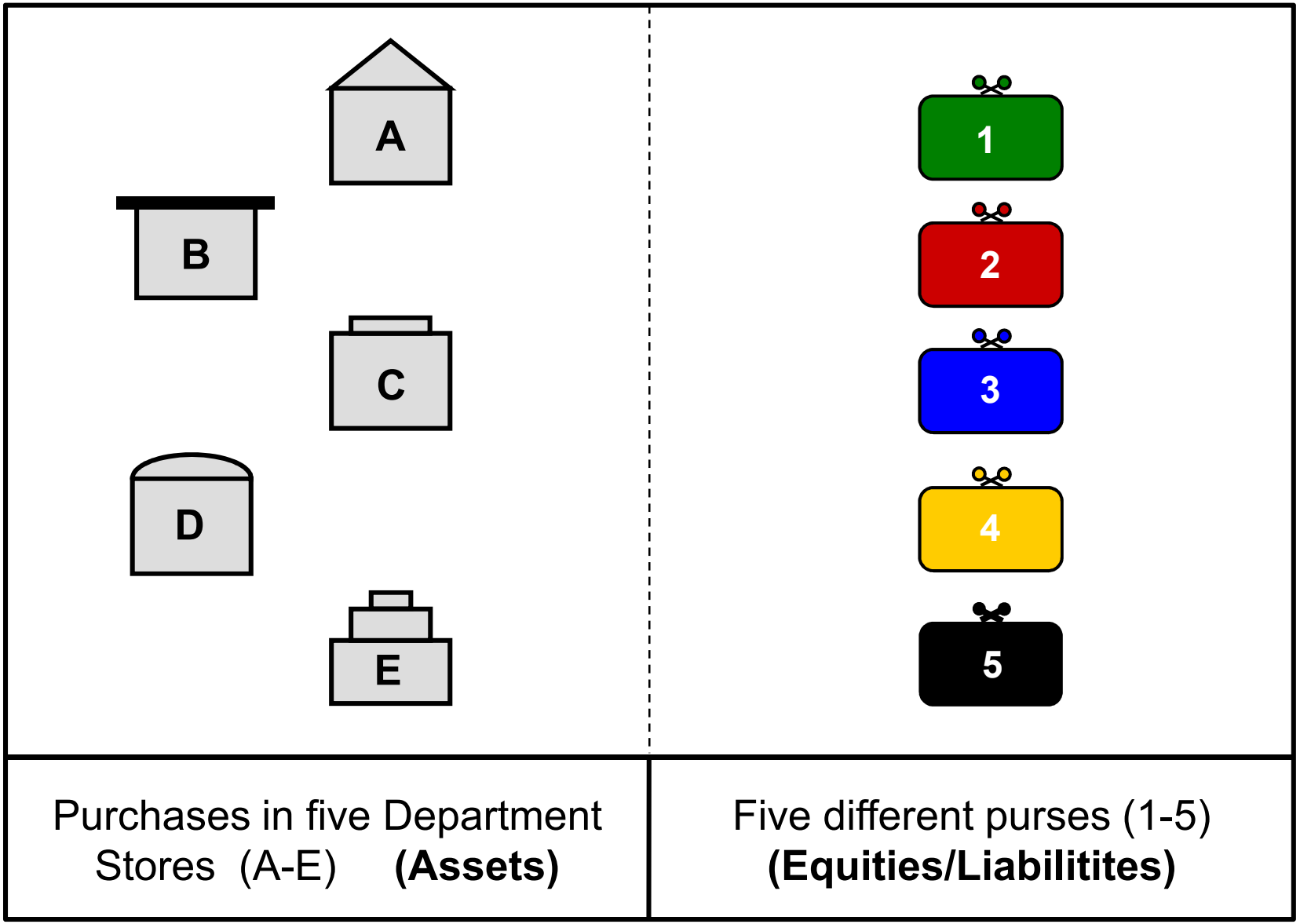
Balance Sheet: Method of the Double-Entry Bookkeeping:



Purchases in five Department Stores (A-E) **(Assets)**	Five different purses (1-5) **(Equities/Liabilitites)**

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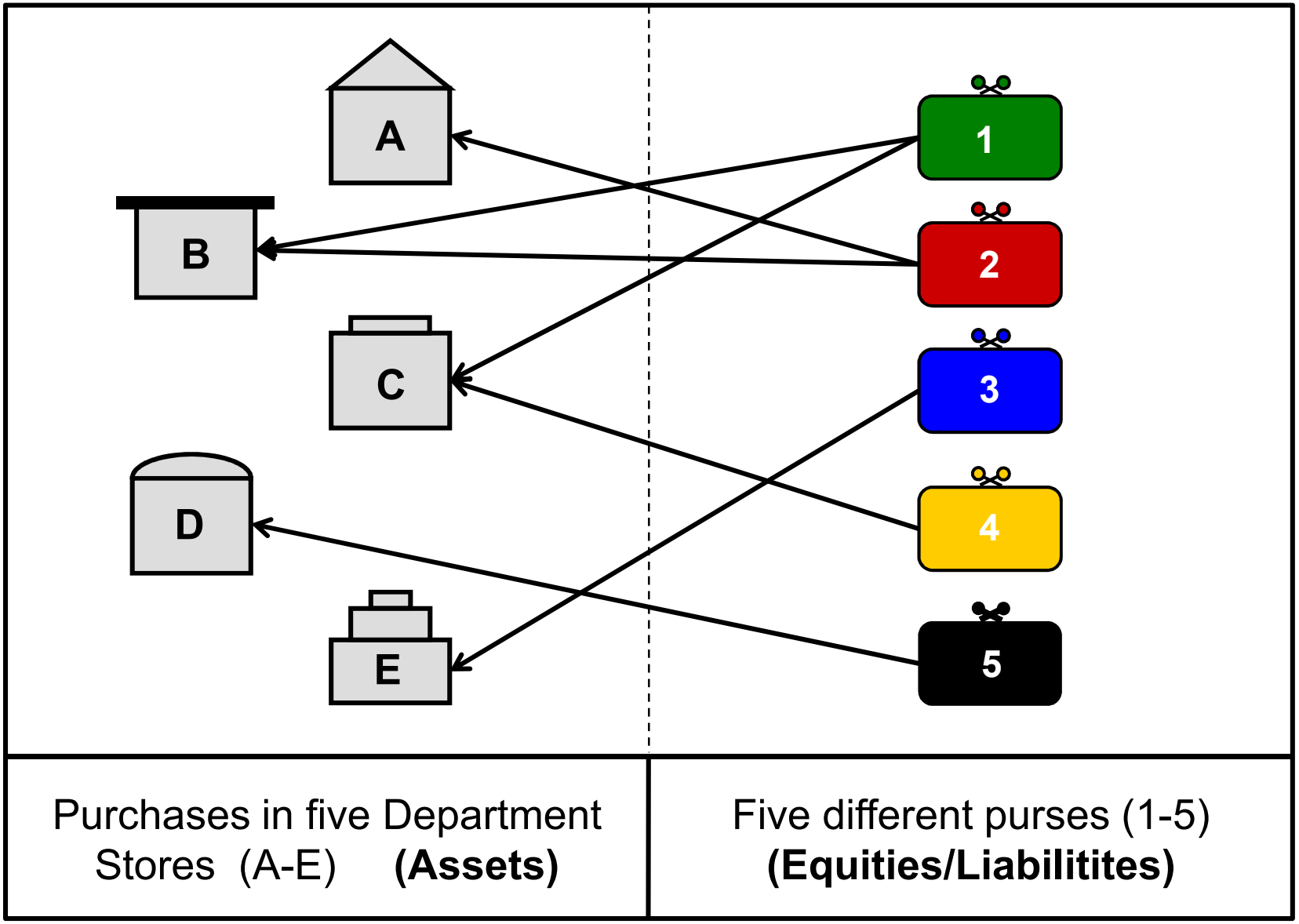
Balance Sheet: Method of the Double-Entry Bookkeeping:



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Innovations: Characteristic "Economic Success"

Balance Sheet: Method of the Double-Entry Bookkeeping:

Uses of Funds		Sources of Funds	
030 €	Department store A (Purchase of a, b, c)	030 €	Purse 2
045 €	Department store B (Purchase of d, e, f)	025 € 020 €	Purse 1 Purse 2
130 €	Department store C (Purchase of g, h, i, j, k)	090 € 040 €	Purse 4 Purse 1
210 €	Department store D (Purchase of l, m, n, o, p)	210 €	Purse 5
015 €	Department store E (Purchase of q, r)	015 €	Purse 3
430 €	**Σ**	**430 €**	**Σ**

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Innovations: Characteristic "Economic Success"

Balance Sheet Structure: Assets →

- **Noncurrent assets:**
  - Intangible assets
  - Property, plant and equipment
  - Financial assets
  - Miscellaneous assets

- **Current assets:**
  - Inventories
  - Recievables
  - Marketable securities, cash, cash equivalents
  - Assets of disposal groups

Innovations: Characteristic "Economic Success"

Balance Sheet Structure: Equity/Liabilities ⟶

- **Equity**

- **Noncurrent liabilities:**
  - Provisions
  - Deferred taxes
  - Financial indebtedness (Time to maturity > 5 years)
  - Other liabilities

- **Current liabilities:**
  - Accounts payable, trade
  - Provisions
  - Financial indebtedness (Time to maturity: < 5 years)
  - Other liabilities and tax liabilities
  - Liabilities of disposal groups

Simple Balance Sheet of a "Garage Company" for the Production and Distribution of Dispersion Paints:

Time of the following financial accounting: Dec. 31, 2020, 24:00 h | Example

Assets		Equity/Liabilities	
▪ **Non current assets:**		▪ **Equity:**	
- Conversion/Installation of a garage	081.400€	- Savings from an inheritance	112.500€
- Acquisition/Installation of a dissolver	023.000€	- Sales proceeds after taxes	031.500€
- Acquisition of a pick-up-transporter	051.600€	▪ **Non current liabilities:**	
		- Liabilities to the bank (depts)	097.000€
▪ **Current assets:**		▪ **Current liabilities:**	
- Acquisition/Storage of acrylic-dispersion	007.500€	- Unpaid invoices	002.500€
- Acquisition/Storage of titaniumdioxide	006.500€	- Open tax payments	006.500€
- Acquisition/Storage of tensides	002.200€		
- Unpayed deliveries	000.900€		
- Electricity and water	003.400€		
- Bank deposits /Current accounts	073.500€		
Σ	**250.000€**	**Σ**	**250.000€**

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Balance Sheet, BASF Group 2020, Assets

Million €	Dec. 31, 2020
Noncurrent assets (Σ)	**50.424**
Intangible assets	13.145
Property, plant and equipment	19.647
Financial assets, integral / non-integral investments	13.334
Deferred tax assets, receivables, other assets	4.298
Current assets (Σ)	**29.868**
Inventories	10.010
Recievables	14.139
Marketable securities, cash and cash equivalents	4.537
Assets of disposal groups	1.182
Total assets	**80.292**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report 2020

Rainer Buerstinghaus

Balance Sheet, BASF Group 2019, Assets

Million €	Dec. 31, 2019
Noncurrent assets (Σ)	**55.960**
Intangible assets	14.525
Property, plant and equipment	21.792
Financial assets, integral / non-integral investments	15.644
Deferred tax assets, receivables, other assets	3.999
Current assets (Σ)	**30.990**
Inventories	11.223
Recievables	12.883
Marketable securities, cash and cash equivalents	2.871
Assets of disposal groups	4.013
Total assets	**86.950**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

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(IAS) 19

Example

Source: BASF Online Report 2019

Rainer Buerstinghaus

Balance Sheet, BASF Group 2018, Assets

Million €	Dec. 31, 2018
Noncurrent assets (Σ)	**43.335**
Intangible assets	16.554
Property, plant and equipment	20.780
Financial assets, integral / non-integral investments	2.773
Deferred tax assets, receivables, other assets	3.228
Current assets (Σ)	**43.221**
Inventories	12.166
Recievables	13.804
Marketable securities, cash and cash equivalents	2.644
Assets of disposal groups	14.607
Total assets	**86.556**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

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(IAS) 19

Example

Source: BASF Online Report 2018

Rainer Buerstinghaus

Balance Sheet, BASF Group 2017, Assets

Million €	Dec. 31, 2017
Noncurrent assets (Σ)	**47.623**
Intangible assets	13.594
Property, plant and equipment	25.258
Financial assets, integral / non-integral investments	5.321
Deferred tax assets, receivables, other assets	3.450
Current assets (Σ)	**31.145**
Inventories	10.303
Recievables	14.295
Marketable securities, cash and cash equivalents	6.547
Assets of disposal groups	(-)
Total assets	**78.768**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

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Example

Source: BASF Online Report 2017

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Balance Sheet, BASF Group 2016, Assets

Million €	Dec. 31, 2016
Noncurrent assets (Σ)	**50.550**
Intangible assets	15.162
Property, plant and equipment	26.413
Financial assets, integral / non-integral investments	5.252
Deferred tax assets, receivables, other assets	3.723
Current assets (Σ)	**25.946**
Inventories	10.005
Recievables	14.030
Marketable securities, cash and cash equivalents	1.911
Assets of disposal groups	(-)
Total assets	**76.496**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

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Example

Source: BASF Online Report 2016

Rainer Buerstinghaus

Balance Sheet, BASF Group 2015, Assets

Million €	Dec. 31, 2015
Noncurrent assets (Σ)	**46.270**
Intangible assets	12.537
Property, plant and equipment	25.260
Financial assets, integral / non-integral investments	4.962
Deferred tax assets, receivables, other assets	3.511
Current assets (Σ)	**24.566**
Inventories	9.693
Recievables	12.611
Marketable securities, cash and cash equivalents	2.262
Assets of disposal groups	(-)
Total assets	**70.836**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

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(IAS) 19

Example

Source: BASF Online Report 2015

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Balance Sheet, BASF Group 2014, Assets

Million €	Dec. 31, 2014
Noncurrent assets (Σ)	**43.939**
Intangible assets	12.967
Property, plant and equipment	23.496
Financial assets, integral / non-integral investments	3.785
Deferred tax assets, receivables, other assets	3.691
Current assets (Σ)	**27.420**
Inventories	11.266
Recievables	14.417
Marketable securities, cash and cash equivalents	1.737
Assets of disposal groups	(-)
Total assets	**71.359**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report 2014

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Balance Sheet, BASF Group 2013, Assets

Million €	Dec. 31, 2013
Noncurrent assets (Σ)	**37.124**
Intangible assets	12.235
Property, plant and equipment	18.254
Financial assets, integral / non-integral investments	4.767
Deferred tax assets, receivables, other assets	1.868
Current assets (Σ)	**27.258**
Inventories	9.592
Recievables	13.006
Marketable securities, cash and cash equivalents	1.832
Assets of disposal groups	2.828
Total assets	**64.382**

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report 2013

IFRS: International Financial Reporting Standards (since 2005) From 2012: **10**: Accounting for parent / subsidiary companies **11**: Difference between joint ventures and joint operations.
IAS: International Accounting Standard from 2012: **19:** Employee benefits, adjustments and interest payments in the year under review.

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Balance Sheet, BASF Group 2012
Assets (IFRS)

Million €	Dec. 31, 2012
Noncurrent assets (Σ)	**35.538**
Intangible assets	12.241
Property, plant and equipment	18.177
Financial assets, integral / non-integral investments	2.925
Deferred tax assets, receivables, other assets	2.195
Current assets (Σ)	**28.789**
Inventories	9.930
Recievables	13.642
Marketable securities, cash and cash equivalents	1.800
Assets of disposal groups	3.417
Total assets	**64.327**

IFRS: International Financial Reporting Standards (ab 2005)

Example

Source: BASF Online Report 2012

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Balance Sheet, BASF Group 2011
Assets (IFRS)

Million €	Dec. 31, 2011
Noncurrent assets (Σ)	**34.087**
Intangible assets	11.919
Property, plant and equipment	17.966
Financial assets, integral / non-integral investments	2.700
Deferred tax assets, receivables, other assets	1.502
Current assets (Σ)	**27.088**
Inventories	10.059
Recievables	14.667
Marketable securities, cash and cash equivalents	2.607
Assets of disposal groups	295
Total assets	**61.175**

IFRS: International Financial Reporting Standards (ab 2005)

Example

Source: BASF Online Report 2011

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Balance Sheet, BASF Group 2010
Assets (IFRS)

Million €	Dec. 31, 2010
Noncurrent assets (Σ)	**34.532**
Intangible assets	12.245
Property, plant and equipment	17.241
Financial assets, integral / non-integral investments	3.281
Deferred tax assets, receivables, other assets	1.765
Current assets (Σ)	**24.861**
Inventories	8.688
Recievables	14.050
Marketable securities, cash and cash equivalents	1.509
Assets of disposal groups	614
Total assets	**59.393**

IFRS: International Financial Reporting Standards (ab 2005)

Example

Source: BASF Online Report 2010

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Balance Sheet, BASF Group 2009
Assets (IFRS)

Million €	Dec. 31, 2009
Noncurrent assets (Σ)	**31.681**
Intangible assets	10.449
Property, plant and equipment	16.285
Financial assets, integral / non-integral investments	2.959
Deferred tax assets, receivables, other assets	1.988
Current assets (Σ)	**19.587**
Inventories	6.776
Recievables	10.961
Marketable securities, cash and cash equivalents	1.850
Assets of disposal groups	-
Total assets	**51.268**

IFRS: International Financial Reporting Standards (ab 2005)

Example

Source: BASF Online Report 2009

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Balance Sheet, BASF Group 2020, Equity and Liabilities

Million €	Dec. 31. 2020
Equity	**34.398**
Noncurrent liabilities	**29.614**
Provisions	10.050
Deferred tax liabilities	2.034
Financial indeptedness	15.819
Other liabilities	1.711
Current liabilities	**16.280**
Accounts payable, trade	5.291
Provisions	2.825
Financial indeptedness	3.395
Other liabilities	4.428
Liabilities of disposal groups	341
Total equity and liabilities	**80.292**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report
2020

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Balance Sheet, BASF Group 2019, Equity and Liabilities

Million €	Dec. 31, 2019
Equity	**42.350**
Noncurrent liabilities	**27.996**
Provisions	9.023
Deferred tax liabilities	2.280
Financial indeptedness	15.015
Other liabilities	1.678
Current liabilities	**16.604**
Accounts payable, trade	5.087
Provisions	2.938
Financial indeptedness	3.362
Other liabilities	4.183
Liabilities of disposal groups	1.034
Total equity and liabilities	**86.950**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report
2019

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Balance Sheet, BASF Group 2018, Equity and Liabilities

Million €	Dec. 31, 2018
Equity	**36.109**
Noncurrent liabilities	**27.118**
Provisions	9.294
Deferred tax liabilities	1.787
Financial indeptedness	15.332
Other liabilities	705
Current liabilities	**23.329**
Accounts payable, trade	5.122
Provisions	3.252
Financial indeptedness	5.509
Other liabilities	3.693
Liabilities of disposal groups	5.753
Total equity and liabilities	**86.556**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

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Example

Source: BASF Online Report
2018

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Balance Sheet, BASF Group 2017, Equity and Liabilities

Million €	Dec. 31, 2017
Equity	**34.756**
Noncurrent liabilities	**29.132**
Provisions	9.771
Deferred tax liabilities	2.731
Financial indeptedness	15.535
Other liabilities	1.095
Current liabilities	**14.880**
Accounts payable, trade	4.971
Provisions	3.229
Financial indeptedness	2.497
Other liabilities	4.183
Liabilities of disposal groups	(-)
Total equity and liabilities	**78.768**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

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(IAS) 19

Example

Source: BASF Online Report
2017

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Balance Sheet, BASF Group 2016, Equity and Liabilities

Million €	Dec. 31, 2016
Equity	**32.568**
Noncurrent liabilities	**28.611**
Provisions	11.876
Deferred tax liabilities	3.317
Financial indeptedness	12.545
Other liabilities	873
Current liabilities	**15.317**
Accounts payable, trade	4.610
Provisions	2.802
Financial indeptedness	3.767
Other liabilities	4.138
Liabilities of disposal groups	(-)
Total equity and liabilities	**76.496**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report
2016

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Balance Sheet, BASF Group 2015, Equity and Liabilities

Million €	Dec. 31, 2015
Equity	**31.545**
Noncurrent liabilities	**25.055**
Provisions	9.682
Deferred tax liabilities	3.381
Financial indeptedness	11.123
Other liabilities	869
Current liabilities	**14.236**
Accounts payable, trade	4.020
Provisions	2.540
Financial indeptedness	4.074
Other liabilities	3.602
Liabilities of disposal groups	(-)
Total equity and liabilities	**70.836**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

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(IAS) 19

Example

Source: BASF Online Report
2015

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Balance Sheet, BASF Group 2014, Equity and Liabilities

Million €	Dec. 31, 2014
Equity	**28.195**
Noncurrent liabilities	**27.271**
Provisions	10.815
Deferred tax liabilities	3.420
Financial indeptedness	11.839
Other liabilities	1.197
Current liabilities	**15.893**
Accounts payable, trade	4.861
Provisions	2.844
Financial indeptedness	3.545
Other liabilities	4.643
Liabilities of disposal groups	(-)
Total equity and liabilities	**71.359**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report
2014

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Balance Sheet, BASF Group 2013, Equity and Liabilities

Million €	Dec. 31, 2013
Equity	**27.789**
Noncurrent liabilities	**21.790**
Provisions	6.633
Deferred tax liabilities	2.849
Financial indeptedness	11.151
Other liabilities	1.157
Current liabilities	**14.803**
Accounts payable, trade	4.505
Provisions	2.616
Financial indeptedness	3.256
Other liabilities	3.136
Liabilities of disposal groups	1.290
Total equity and liabilities	**64.382**

IFRS: International Financial Reporting Standards (From 2005)
IAS: International Accounting Standard

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report
2013

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Balance Sheet, BASF Group 2012, Equity and Liabilities

Million €	Dec. 31, 2012
Equity	**25.804**
Noncurrent liabilities	**21.191**
Provisions	8.484
Deferred tax liabilities	2.511
Financial indeptedness	9.113
Other liabilities	1.083
Current liabilities	**17.332**
Accounts payable, trade	4.696
Provisions	2.687
Financial indeptedness	4.242
Other liabilities	3.475
Liabilities of disposal groups	2.232
Total equity and liabilities	**64.327**

IFRS: International Financial Reporting Standards (From 2005)

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report
2012

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Balance Sheet, BASF Group 2011, Equity and Liabilities

Million €	Dec. 31, 2011
Equity	**25.385**
Noncurrent liabilities	**19.313**
Provisions	6.524
Deferred tax liabilities	2.628
Financial indeptedness	9.019
Other liabilities	1.142
Current liabilities	**16.477**
Accounts payable, trade	5.121
Provisions	3.210
Financial indeptedness	3.985
Other liabilities	4.074
Liabilities of disposal groups	87
Total equity and liabilities	**61.175**

IFRS: International Financial Reporting Standards (From 2005)

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report 2011

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Balance Sheet, BASF Group 2010, Equity and Liabilities

Million €	Dec. 31, 2010
Equity	**22.657**
Noncurrent liabilities	**21.168**
Provisions	6.130
Deferred tax liabilities	2.467
Financial indeptedness	11.670
Other liabilities	901
Current liabilities	**15.568**
Accounts payable, trade	4.738
Provisions	3.324
Financial indeptedness	3.369
Other liabilities	3.942
Liabilities of disposal groups	195
Total equity and liabilities	**59.393**

IFRS: International Financial Reporting Standards (From 2005)

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report
2010

Rainer Buerstinghaus

Balance Sheet, BASF Group 2009, Equity and Liabilities

Million €	Dec. 31, 2009
Equity	**18.609**
Noncurrent liabilities	**20.979**
Provisions	5.544
Deferred tax liabilities	2.093
Financial indeptedness	12.444
Other liabilities	898
Current liabilities	**11.680**
Accounts payable, trade	2.786
Provisions	3.276
Financial indeptedness	2.375
Other liabilities	3.243
Liabilities of disposal groups	-
Total equity and liabilities	**51.268**

IFRS: International Financial Reporting Standards (From 2005)

(IFRS) 10,11
(IAS) 19

Example

Source: BASF Online Report
2009

Rainer Buerstinghaus

Balance Sheet Analysis

It is an Indispensable Source of Information!

for **Shareholders**	→	Expected profits, increases in value (company), share price increases (stocks).
for **Stock Analysts**	→	Formulation of recommendations (purchase/sale/hold).
for **the Management**	→	Key figures for the business results and the target achievements of the previous periods.
for **Tax Authorities**	→	Amount of taxable profits, financing of government expenditures.
for **Banks**	→	Checking the creditworthiness / financial strength of a borrowing company.
for **Competitors**	→	Determination of one's own competitive position and one´s own strategy-consistency.
for other **Companies**	→	Financial check of the trustworthiness of business/cooperation partners.

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis: Solid Source of Information!

Assets Structure (*Asset Side)*   Intensity of the noncurrent (fixed) assets.   Intensity of the current (floating) assets.
Capital Structure *(Liabilities Side)*   Capital ratio, debt to total capital,   Debt coefficient (Leverage).
Financing/Liquidity Structure *(Asset/Liabilities Side)*   Equity-to-fixed assets ratio.
Operating Income *(Statements of Operating Results)*   Profit on sales, cashflow.

Balance Sheet Analysis ⟶ Valuation of a Company

⟶ *Assets Structure* (*Asset Side*):

Intensity of the fixed assets: Noncurrent assets/Total assets.
Intensity of the floating assets: Current assets/Total assets.

⟶ *Capital Structure* (*Liabilities Side*):

Capital ratio: Equity capital/Total capital.
Debt to total capital: Borrowed capital/Total capital.
Debt Coefficient; Leverage: Borrowed capital/Equity capital.

⟶ *Financing-/Liquidity Structure* (*Asset/Liabilities Side*):

Equity-to-fixed assets ratio:

$$\frac{\text{(Equity + noncurrent borrowed capital) x 100}}{\text{Fixed/noncurrent assets}}$$

⟶ *Operating Income* (*Statement of Operating Results*):

Cashflow, **Net operating margin:**

$$\frac{\text{EBIT x 100}}{\text{Net sales}}$$

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2020

Source (Basic Figures): BASF Online Report
2020

Example

Assets Structure (Asset Side):

Intensity of the fixed assets: 0,628

Intensity of the floating assets: 0,372

Capital Structure (Liabilities Side):

Capital ratio: 0,428

Debt to total capital: 0,572

Debt coefficient; Leverage: 1,334

Financing- and Liquidity Structure (Asset/Liabilities Side):

Equity to fixed assets ratio: 127%

Operating Income (Statement of Operating Results):

Net operating margin: − 0,3%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2019

Source (Basic Figures):
BASF Online Report
2019

Example

Assets Structure (Asset Side):
Intensity of the fixed assets: 0,644
Intensity of the floating assets: 0,356

Capital Structure (Liabilities Side):
Capital ratio: 0,487
Debt to total capital: 0,513
Debt coefficient; Leverage: 1,053

Financing- and Liquidity Structure (Asset/Liabilities Side):
Equity to fixed assets ratio: 126%

Operating Income (Statement of Operating Results):
Net operating margin: 6,8%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2018

Source (Basic Figures): BASF Online Report
2018

Example

Assets Structure (Asset Side):

Intensity of the fixed assets: 0,501
Intensity of the floating assets: 0,499

Capital Structure (Liabilities Side):

Capital ratio: 0,417
Debt to total capital: 0,583
Debt coefficient; Leverage: 1,397

Financing- and Liquidity Structure (Asset/Liabilities Side):

Equity to fixed assets ratio: 146%

Operating Income (Statement of Operating Results):

Net operating margin: 9,6%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2017

Source (Basic Figures): BASF Online Report
2017

Example

Assets Structure (Asset Side):

Intensity of the fixed assets: 0,605
Intensity of the floating assets: 0,395

Capital Structure (Liabilities Side):

Capital ratio: 0,441
Debt to total capital: 0,559
Debt coefficient; Leverage: 1,266

Financing- and Liquidity Structure (Asset/Liabilities Side):

Equity to fixed assets ratio: 134%

Operating Income (Statement of Operating Results):

Net operating margin: 13,2%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2016

Source (Basic Figures): BASF Online Report
2016

Example

Assets Structure (Asset Side):

Intensity of the fixed assets: 0,661
Intensity of the floating assets: 0,339

Capital Structure (Liabilities Side):

Capital ratio: 0,426
Debt to total capital: 0,574
Debt coefficient; Leverage: 1,349

Financing- and Liquidity Structure (Asset/Liabilities Side):

Equity to fixed assets ratio: 121%

Operating Income (Statement of Operating Results):

Net operating margin: 10,9%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2015

Source (Basic Figures):
BASF Online Report
2015

Example

Assets Structure (Asset Side):
Intensity of the fixed assets: 0,653
Intensity of the floating assets: 0,347

Capital Structure (Liabilities Side):
Capital ratio: 0,445
Debt to total capital: 0,555
Debt coefficient; Leverage: 1,246

Financing- and Liquidity Structure (Asset/Liabilities Side):
Equity to fixed assets ratio: 122%

Operating Income (Statement of Operating Results):
Net operating margin: 8,9%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2014

Source (Basic Figures): BASF Online Report
2014

Example

Assets Structure (Asset Side):

Intensity of the fixed assets: 0,616

Intensity of the floating assets: 0,384

Capital Structure (Liabilities Side):

Capital ratio: 0,395

Debt to total capital: 0,605

Debt coefficient; Leverage: 1,531

Financing- and Liquidity Structure (Asset/Liabilities Side):

Equity to fixed assets ratio: 126%

Operating Income (Statement of Operating Results):

Net operating margin: 10,3%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2013

Source (Basic Figures): BASF Online Report
2013

Example

Assets Structure (Asset Side):

Intensity of the fixed assets: 0,577
Intensity of the floating assets: 0,423

Capital Structure (Liabilities Side):

Capital ratio: 0,432
Debt to total capital: 0,568
Debt coefficient; Leverage: 1,316

Financing- and Liquidity Structure (Asset/Liabilities Side):

Equity to fixed assets ratio: 134%

Operating Income (Statement of Operating Results):

Net operating margin: 09,8%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2012

Source (Basic Figures):
BASF Online Report
2012

Example

Assets Structure (Asset Side):
Intensity of the fixed assets: 0,552
Intensity of the floating assets: 0,448

Capital Structure (Liabilities Side):
Capital ratio: 0,401
Debt to total capital: 0,599
Debt coefficient; Leverage: 1,493

Financing- and Liquidity Structure (Asset/Liabilities Side):
Equity to fixed assets ratio: 132%

Operating Income (Statement of Operating Results):
Net operating margin: 11,4%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2011

Source (Basic Figures): BASF Online Report
2011

Example

Assets Structure (Asset Side):

Intensity of the fixed assets: 0,557

Intensity of the floating assets: 0,443

Capital Structure (Liabilities Side):

Capital ratio: 0,415

Debt to total capital: 0,585

Debt coefficient; Leverage: 1,410

Financing- and Liquidity Structure (Asset/Liabilities Side):

Equity to fixed assets ratio: 131%

Operating Income (Statement of Operating Results):

Net operating margin: 11,7%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2010

Source (Basic Figures): BASF Online Report
2010

Example

Assets Structure (Asset Side):

Intensity of the fixed assets: 0,581
Intensity of the floating assets: 0,419

Capital Structure (Liabilities Side):

Capital ratio: 0,381
Debt to total capital: 0,619
Debt coefficient; Leverage: 1,621

Financing- and Liquidity Structure (Asset/Liabilities Side):

Equity to fixed assets ratio: 127%

Operating Income (Statement of Operating Results):

Net operating margin: 12,1%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2009

Source (Basic Figures):
BASF Online Report
2009

Example

Assets Structure (Asset Side):
Intensity of the fixed assets: 0,618
Intensity of the floating assets: 0,382

Capital Structure (Liabilities Side):
Capital ratio: 0,363
Debt to total capital: 0,637
Debt coefficient; Leverage: 1,755

Financing- and Liquidity Structure (Asset/Liabilities Side):
Equity to fixed assets ratio: 125%

Operating Income (Statement of Operating Results):
Net operating margin: 07,3%

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2020

Source (Basic Figures): BASF Online Report
2020

Example

Assets Structure (Assets Side):

Intensity of the Fixed Assets: 0,628

Noncurrent assets: 50.424.000.000€

Total assets: 80.292.000.000€

Assets Structure (Assets Side):

Intensity of the Floating Assets: 0,372

Current assets: 29.868.000.000€

Total assets: 80.292.000.000€

Σ = 1,000

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Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2019

Source (Basic Figures):
BASF Online Report
2019

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: **0,644**

Noncurrent assets: 55.960.000.000€
Total assets: 86.950.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: **0,356**

Current assets: 30.990.000.000€
Total assets: 86.950.000.000€

Σ = 1,000

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2018**

Source (Basic Figures): BASF Online Report
2018

Example

Assets Structure (Assets Side):

Intensity of the Fixed Assets: **0,501**

Noncurrent assets: 43.335.000.000€

Total assets: 86.556.000.000€

Assets Structure (Assets Side):

Intensity of the Floating Assets: **0,499**

Current assets: 43.221.000.000€

Total assets: 86.556.000.000€

Σ = 1,000

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2017

Source (Basic Figures):
BASF Online Report
2017

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: 0,605

Noncurrent assets: 47.623.000.000€
Total assets: 78.768.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: 0,395

Current assets: 31.145.000.000€
Total assets: 78.768.000.000€

Σ = 1,000

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2016

Source (Basic Figures):
BASF Online Report
2016

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: 0,661

Noncurrent assets: 50.550.000.000€
Total assets: 76.496.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: 0,339

Current assets: 25.946.000.000€
Total assets: 76.496.000.000€

Σ = 1,000

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2015

Source (Basic Figures):
BASF Online Report
2015

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: 0,653

Noncurrent assets: 46.270.000.000€
Total assets: 70.836.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: 0,347

Current assets: 24.566.000.000€
Total assets: 70.836.000.000€

Σ = 1,000

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2014

Source (Basic Figures):
BASF Online Report
2014

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: 0,616

Noncurrent assets: 43.939.000.000€
Total assets: 71.359.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: 0,384

Current assets: 27.420.000.000€
Total assets: 71.359.000.000€

Σ = 1,000

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2013

Source (Basic Figures):
BASF Online Report
2013

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: 0,577

Noncurrent assets: 37.124.000.000€
Total assets: 64.382.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: 0,423

Current assets: 27.258.000.000€
Total assets: 64.382.000.000€

Σ = 1,000

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2012

Source (Basic Figures):
BASF Online Report
2012

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: 0,552

Noncurrent assets: 35.538.000.000€
Total assets: 64.327.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: 0,448

Current assets: 28.789.000.000€
Total assets: 64.327.000.000€

Σ = 1,000

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2011

Source (Basic Figures):
BASF Online Report
2011

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: 0,557

Noncurrent assets: 34.087.000.000€
Total assets: 61.175.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: 0,443

Current assets: 27.088.000.000€
Total assets: 61.175.000.000€

Σ = 1,000

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2010

Source (Basic Figures):
BASF Online Report
2010

Example

Assets Structure (Assets Side):
Intensity of the Fixed Assets: **0,581**

Noncurrent assets: 34.532.000.000€
Total assets: 59.393.000.000€

Assets Structure (Assets Side):
Intensity of the Floating Assets: **0,419**

Current assets: 24.861.000.000€
Total assets: 59.393.000.000€

Σ = 1,000

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2009**

Source (Basic Figures): BASF Online Report
2009

Example

Assets Structure (Assets Side):

Intensity of the Fixed Assets: 0,618

Noncurrent assets: 31.681.000.000€

Total assets: 51.268.000.000€

Assets Structure (Assets side):

Intensity of the Floating Assets: 0,382

Current assets: 19.587.000.000€

Total assets: 51.268.000.000€

Σ = 1,000

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2020**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,428**

Equity capital: 34.398.000.000€
Total capital: 80.292.000.000€

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,572**

Borrowed capital: 45.894.000.000€
Total capital: 80.292.000.000€

Capital Structure (Liabilities Side)
Leverage: → **1,334**

Borrowed capital: 45.894.000.000€
Equity capital: 34.398.000.000€

Example

Σ = 1,000

Source (Basic Figures):
BASF Online Report
2020

Rainer Buerstinghaus

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2019**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,487**

Equity capital: 42.350.000.000€
Total capital: 86.950.000.000€

Example

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,513**

Borrowed capital: 44.600.000.000€
Total capital: 86.950.000.000€

Σ = 1,000

Capital Structure (Liabilities Side)
Leverage: → **1,053**

Borrowed capital: 44.600.000.000€
Equity capital: 42.350.000.000€

Source (Basic Figures):
BASF Online Report
2019

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2018**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,417**

Equity capital: 36.109.000.000€
Total capital: 86.556.000.000€

Example

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,583**

Borrowed capital: 50.447.000.000€
Total capital: 86.556.000.000€

Σ = 1,000

Capital Structure (Liabilities Side)
Leverage: → **1,397**

Borrowed capital: 50.447.000.000€
Equity capital: 36.109.000.000€

Source (Basic Figures):
BASF Online Report
2018

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Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2017**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,441**

Equity capital: 34.756.000.000€
Total capital: 78.768.000.000€

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,559**

Borrowed capital: 44.012.000.000€
Total capital: 78.768.000.000€

Capital Structure (Liabilities Side)
Leverage: → **1,266**

Borrowed capital: 44.012.000.000€
Equity capital: 34.756.000.000€

Example

Σ = 1,000

Source (Basic Figures):
BASF Online Report
2017

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Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2016**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,426**

Equity capital: 32.568.000.000€
Total capital: 76.496.000.000€

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,574**

Borrowed capital: 43.928.000.000€
Total capital: 76.496.000.000€

Capital Structure (Liabilities Side)
Leverage: → **1,349**

Borrowed capital: 43.928.000.000€
Equity capital: 32.568.000.000€

Example

Σ = 1,000

Source (Basic Figures):
BASF Online Report
2016

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2015

Capital Structure (Liabilities Side)
Capital Ratio: → **0,445**

Equity capital: 31.545.000.000€
Total capital: 70.836.000.000€

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,555**

Borrowed capital: 39.291.000.000€
Total capital: 70.836.000.000€

Capital Structure (Liabilities Side)
Leverage: → **1,246**

Borrowed capital: 39.291.000.000€
Equity capital: 31.545.000.000€

Example

Σ = 1,000

Source (Basic Figures):
BASF Online Report
2015

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2014**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,395**

Equity capital: 28.195.000.000€
Total capital: 71.359.000.000€

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,605**

Borrowed capital: 43.164.000.000€
Total capital: 71.359.000.000€

Capital Structure (Liabilities Side)
Leverage: → **1,531**

Borrowed capital: 43.164.000.000€
Equity capital: 28.195.000.000€

Example

Σ = 1,000

Source (Basic Figures):
BASF Online Report
2014

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2013

Capital Structure (Liabilities Side)
Capital Ratio: → **0,432**

Equity capital: 27.789.000.000€
Total capital: 64.382.000.000€

Example

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,568**

Borrowed capital: 36.583.000.000€
Total capital: 64.382.000.000€

Σ = 1,000

Capital Structure (Liabilities Side)
Leverage: → **1,316**

Borrowed capital: 36.583.000.000€
Equity capital: 27.789.000.000€

Source (Basic Figures):
BASF Online Report
2013

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Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → Figures BASF Group 2012

Capital Structure (Liabilities Side)
Capital Ratio: → **0,401**

Equity capital: 25.804.000.000€
Total capital: 64.327.000.000€

Example

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,599**

Borrowed capital: 38.523.000.000€
Total capital: 64.327.000.000€

Σ = 1,000

Capital Structure (Liabilities Side)
Leverage: → **1,493**

Borrowed capital: 38.523.000.000€
Equity capital: 25.804.000.000€

Source (Basic Figures):
BASF Online Report
2012

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2011**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,415**

Equity capital: 25.385.000.000€
Total capital: 61.175.000.000€

Capital Structure (Liabilities side)
Debt to Total Capital: → **0,585**

Borrowed capital: 35.790.000.000€
Total capital: 61.175.000.000€

Capital Structure (Liabilities Side)
Leverage: → **1,410**

Borrowed capital: 35.790.000.000€
Equity capital: 25.385.000.000€

Example

Σ = 1,000

Source (Basic Figures):
BASF Online Report
2011

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2010**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,381**

Equity capital: 22.657.000.000€
Total capital: 59.393.000.000€

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,619**

Borrowed capital: 36.736.000.000€
Total capital: 59.393.000.000€

Capital Structure (Liabilities Side)
Leverage: → **1,621**

Borrowed capital: 36.736.000.000€
Equity capital: 22.657.000.000€

Example

Σ = 1,000

Source (Basic Figures):
BASF Online Report
2010

Innovations: Characteristic "Economic Success"

Balance Sheet Analysis → **Figures BASF Group 2009**

Capital Structure (Liabilities Side)
Capital Ratio: → **0,363**

Equity capital: 18.609.000.000€
Total capital: 51.268.000.000€

Capital Structure (Liabilities Side)
Debt to Total Capital: → **0,637**

Borrowed capital: 32.659.000.000€
Total capital: 51.268.000.000€

Capital Structure (Liabilities Side)
Leverage: → **1,755**

Borrowed capital: 32.659.000.000€
Equity capital: 18.609.000.000€

Example

Σ = 1,000

Source (Basic Figures):
BASF Online Report
2009

Balance Sheet Analysis ⟶ **Real Capital Ratios (D):**

Valuation **(Producing Companies)**	**Capital Ratios**
below average	00% - 20%
average	20% - 35%
good	35% - 45%
very good, excellent	> 45%

Valuation **(Banks, Reinsurances)**	**Capital Ratios**
below average	00% - 06%
average (Basel-III: 07% bis 2019)	06% - 09%
good – very good	> 09%

In the balance sheets, banks report their "borrowed" money left by the customer beyond the balance sheet date as borrowed capital for years. The balance sheet totals accumulate accordingly and the total debt to equity ratios grow (⟶ The equity quota falls).

Balance Sheet Analysis → BASF Group 2020

Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount Source (Basic Figures): BASF Online Report 2020
Equity capital	34.398.000.000€
Noncurrent borrowed capital	29.614.000.000€
Sum (Σ)	64.012.000.000€
100 x Sum (100 x Σ)	6.401.200.000.000€
Fixed noncurrent assets (FA)	50.424.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**127%**

Operating Income (Statement of Operating Results)	Amount
EBIT	– 191.000.000€
100 x EBIT	– 19.100.000.000€
Net sales (NS)	59.149.000.000€
Net Operating Margin (100 x EBIT)/NU	**– 0,3%**

Balance Sheet Analysis → BASF Group 2019

Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount Source (Basic Figures): BASF Online Report 2019
Equity capital	42.350.000.000€
Noncurrent borrowed capital	27.996.000.000€
Sum (Σ)	70.346.000.000€
100 x Sum (100 x Σ)	7.034.600.000.000€
Fixed noncurrent assets (FA)	55.960.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**126%**

Operating Income (Statement of Operating Results)	Amount
EBIT	4.052.000.000€
100 x EBIT	405.200.000.000€
Net sales (NS)	59.316.000.000€
Net Operating Margin (100 x EBIT)/NU	**06,8%**

Balance Sheet Analysis → BASF Group 2018 Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount (Source (Basic Figures): BASF Online Report 2018)
Equity capital	36.109.000.000€
Noncurrent borrowed capital	27.118.000.000€
Sum (Σ)	63.227.000.000€
100 x Sum (100 x Σ)	6.322.700.000.000€
Fixed noncurrent assets (FA)	43.335.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**146%**

Operating Income (Statement of Operating Results)	Amount
EBIT	6.033.000.000€
100 x EBIT	603.300.000.000€
Net sales (NS)	62.675.000.000€
Net Operating Margin (100 x EBIT)/NU	**09,6%**

Balance Sheet Analysis → BASF Group 2017

Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount (Source (Basic Figures): BASF Online Report 2017)
Equity capital	34.756.000.000€
Noncurrent borrowed capital	29.132.000.000€
Sum (Σ)	63.888.000.000€
100 x Sum (100 x Σ)	6.388.800.000.000€
Fixed noncurrent assets (FA)	47.623.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**134%**

Operating Income (Statement of Operating Results)	Amount
EBIT	8.522.000.000€
100 x EBIT	852.200.000.000€
Net sales (NS)	64.475.000.000€
Net Operating Margin (100 x EBIT)/NU	**13,2%**

Balance Sheet Analysis → BASF Group 2016

Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount Source (Basic Figures): BASF Online Report 2016
Equity capital	32.568.000.000€
Noncurrent borrowed capital	28.611.000.000€
Sum (Σ)	61.179.000.000€
100 x Sum (100 x Σ)	6.117.900.000.000€
Fixed noncurrent assets (FA)	50.550.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**121%**

Operating Income (Statement of Operating Results)	Amount
EBIT	6.275.000.000€
100 x EBIT	627.500.000.000€
Net sales (NS)	57.550.000.000€
Net Operating Margin (100 x EBIT)/NU	**10,9%**

Balance Sheet Analysis → BASF Group 2015 Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount (Source (Basic Figures): BASF Online Report 2015)
Equity capital	31.545.000.000€
Noncurrent borrowed capital	25.055.000.000€
Sum (Σ)	56.600.000.000€
100 x Sum (100 x Σ)	5.660.000.000.000€
Fixed noncurrent assets (FA)	46.270.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**122%**

Operating Income (Statement of Operating Results)	Amount
EBIT	6.248.000.000€
100 x EBIT	624.800.000.000€
Net sales (NS)	70.449.000.000€
Net Operating Margin (100 x EBIT)/NU	**08,9%**

Balance Sheet Analysis → BASF Group 2014

Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount Source (Basic Figures): BASF Online Report 2014
Equity capital	28.195.000.000€
Noncurrent borrowed capital	27.271.000.000€
Sum (Σ)	55.466.000.000€
100 x Sum (100 x Σ)	5.546.600.000.000€
Fixed noncurrent assets (FA)	43.939.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**126%**

Operating Income (Statement of Operating Results)	Amount
EBIT	7.626.000.000€
100 x EBIT	762.600.000.000€
Net sales (NS)	74.326.000.000€
Net Operating Margin (100 x EBIT)/NU	**10,3%**

Balance Sheet Analysis → BASF Group 2013 Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount (Source (Basic Figures): BASF Online Report 2013)
Equity capital	27.789.000.000€
Noncurrent borrowed capital	21.790.000.000€
Sum (Σ)	49.579.000.000€
100 x Sum (100 x Σ)	4.957.900.000.000€
Fixed noncurrent assets (FA)	37.124.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**134%**

Operating Income (Statement of Operating Results)	Amount
EBIT	7.273.000.000€
100 x EBIT	727.300.000.000€
Net sales (NS)	73.973.000.000€
Net Operating Margin (100 x EBIT)/NU	**09,8%**

Balance Sheet Analysis → BASF Group 2012

Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount (Source (Basic Figures): BASF Online Report 2012)
Equity capital	25.804.000.000€
Noncurrent borrowed capital	21.191.000.000€
Sum (Σ)	46.995.000.000€
100 x Sum (100 x Σ)	4.699.500.000.000€
Fixed noncurrent assets (FA)	35.538.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**132%**

Operating Income (Statement of Operating Results)	Amount
EBIT	8.976.000.000€
100 x EBIT	897.600.000.000€
Net sales (NS)	78.729.000.000€
Net Operating Margin (100 x EBIT)/NU	**11,4%**

Balance Sheet Analysis → BASF Group 2011

Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount (Source (Basic Figures): BASF Online Report 2011)
Equity capital	25.385.000.000€
Noncurrent borrowed capital	19.313.000.000€
Sum (Σ)	44.698.000.000€
100 x Sum (100 x Σ)	4.469.800.000.000€
Fixed noncurrent assets (FA)	34.087.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**131%**

Operating Income (Statement of Operating Results)	Amount
EBIT	8.586.000.000€
100 x EBIT	858.600.000.000.€
Net sales (NS)	73.497.000.000€
Net Operating Margin (100 x EBIT)/NU	**11,7%**

Balance Sheet Analysis → BASF Group 2010

Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount Source (Basic Figures): BASF Online Report 2010
Equity capital	22.657.000.000€
Noncurrent borrowed capital	21.168.000.000€
Sum (Σ)	43.825.000.000€
100 x Sum (100 x Σ)	4.382.500.000.000€
Fixed noncurrent assets (FA)	34.532.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**132%**

Operating Income (Statement of Operating Results)	Amount
EBIT	7.761.000.000€
100 x EBIT	776.100.000.000.€
Net sales (NS)	63.873.000.000€
Net Operating Margin (100 x EBIT)/NU	**12,1%**

Balance Sheet Analysis → BASF Group 2009

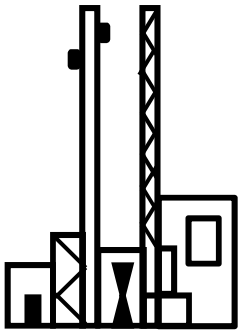
Example

Financing and Liquidity Structure (Asset/Liabilities Side)	Amount Source (Basic Figures): BASF Online Report 2009
Equity capital	18.609.000.000€
Noncurrent borrowed capital	20.979.000.000€
Sum (Σ)	39.588.000.000€
100 x Sum (100 x Σ)	3.958.800.000.000€
Fixed noncurrent assets (FA)	31.681.000.000€
Equity-to-Fixed Assets Ratio (100 x Σ) / FA	**125%**

Operating Income (Statement of Operating Results)	Amount
EBIT	3.677.000.000€
100 x EBIT	367.700.000.000.€
Net sales (NS)	50.693.000.000€
Net Operating Margin (100 x EBIT)/NU	**07,3%**

Innovations: Characteristic "Economic Success"

Equity-to-Fixed Assets Ratio → **Illustration: Steamcracker**



Investment:
600.000.000 €

Long-term available financial funds:

500.000.000 € Equity capital
250.000.000 € Noncurrent borrowed capital (Bank)

Equity-to-fixed assets ratio:

$$\frac{750.000.000\ € \times 100}{600.000.000\ €}$$

→ **125%**

Accounting Principle: Fixed Assets should always be financed with *long-term* liabilities!

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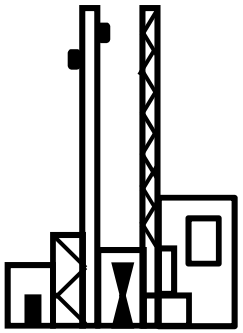
Innovations: Characteristic "Economic Success"

Equity-to-Fixed Assets Ratio → **Illustration: Steamcracker**



Investment:
600.000.000 €

Long-term available financial funds:

200.000.000 € Equity capital
100.000.000 € Noncurrent borrowed capital (Bank)
300.000.000 € Current borrowed capital (Bank)

Equity-to-fixed assets ratio:

$$\frac{300.000.000\ € \times 100}{600.000.000\ €}$$

⛔ → **050%**

Accounting Principle: Fixed Assets should always be financed with *long-term* liabilities!

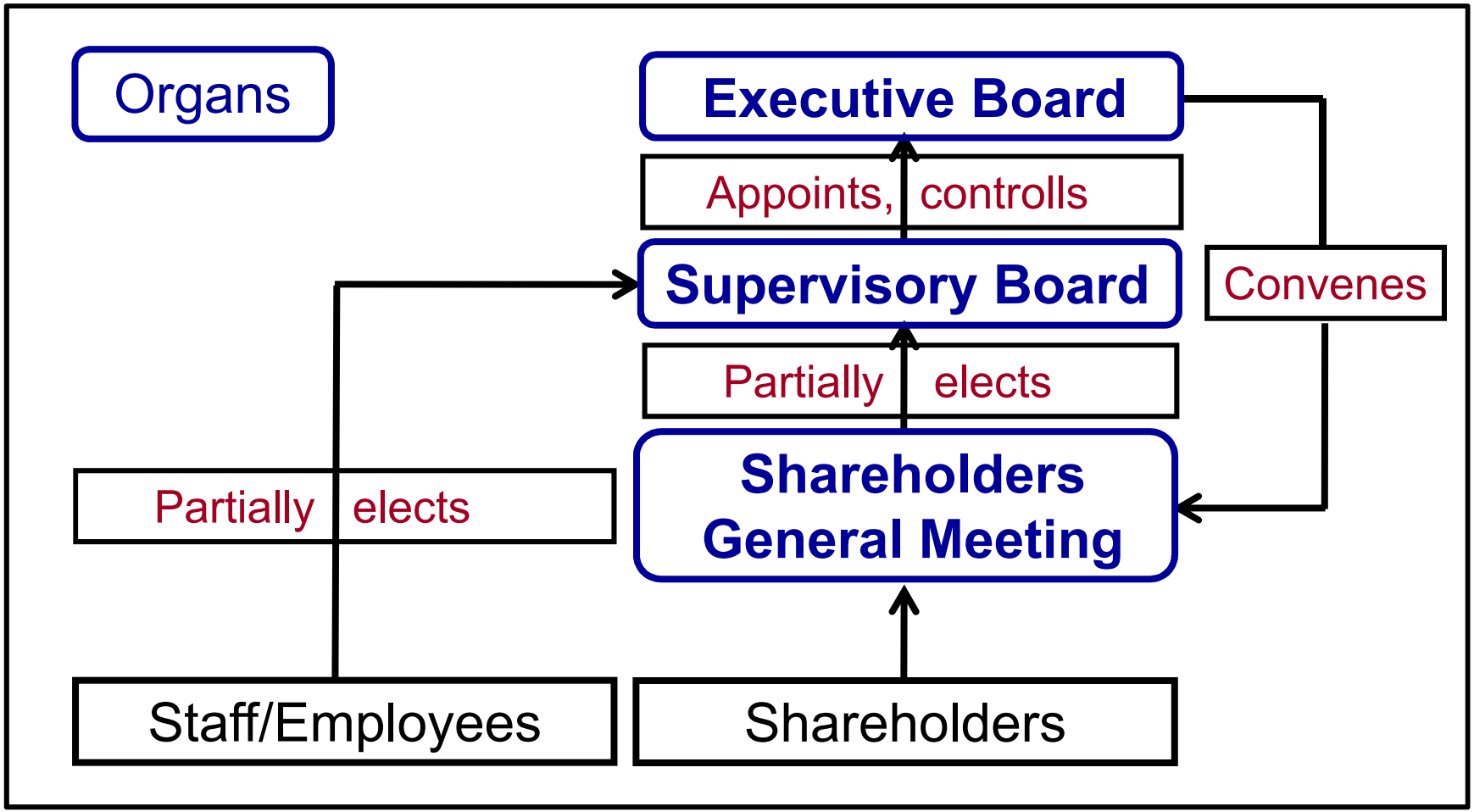
Rainer Buerstinghaus

Stock Corporation, Characteristics

- Capital Company, "Legal Person".
- Founding: By one or more persons.
- Share capital: At least € 50,000.00 (Σ of the nominal value of all shares held by shareholders. Nominal value of one share: At least € 1.00).
- The corporation (AG) is liable with its assets for the debts of the company.
- Organs: *Annual General Meeting* (Shareholders' Meeting), *Management Board* (Management), *Supervisory Board* (Control Body).
- Legal basis: Stock Corporation Law of 9-6-1965.

Legal Forms of Companies: Stock Corporation (AG)

Advantage: By issuing shares, large amounts of corporate capital can be procured.



Innovations: Characteristic "Economic Success"

Share: Definition, Shareholder Function, Trading:

- **Share:** →

  Security that documents a corresponding share of the nominal capital of a listed corporation.

- **Shareholder:** →

  Entrepreneurs on a small scale: Self responsible investments or divestments by means of equities: The realization of opportunities and the avoidance of incalculable share price risks; Periodical earnings: Dividends.

- **Trade:** → Stock Exchange (V. d. Beurs, 1510, Bruges)

Innovations: Characteristic "Economic Success"

Shareholders Rights as Stock Owners (Ordinary Shares):

- **Property Rights**

  Right of subscription regarding dividends.
  Right of pre-emption regarding new shares.
  Entitlement to liquidation proceeds.

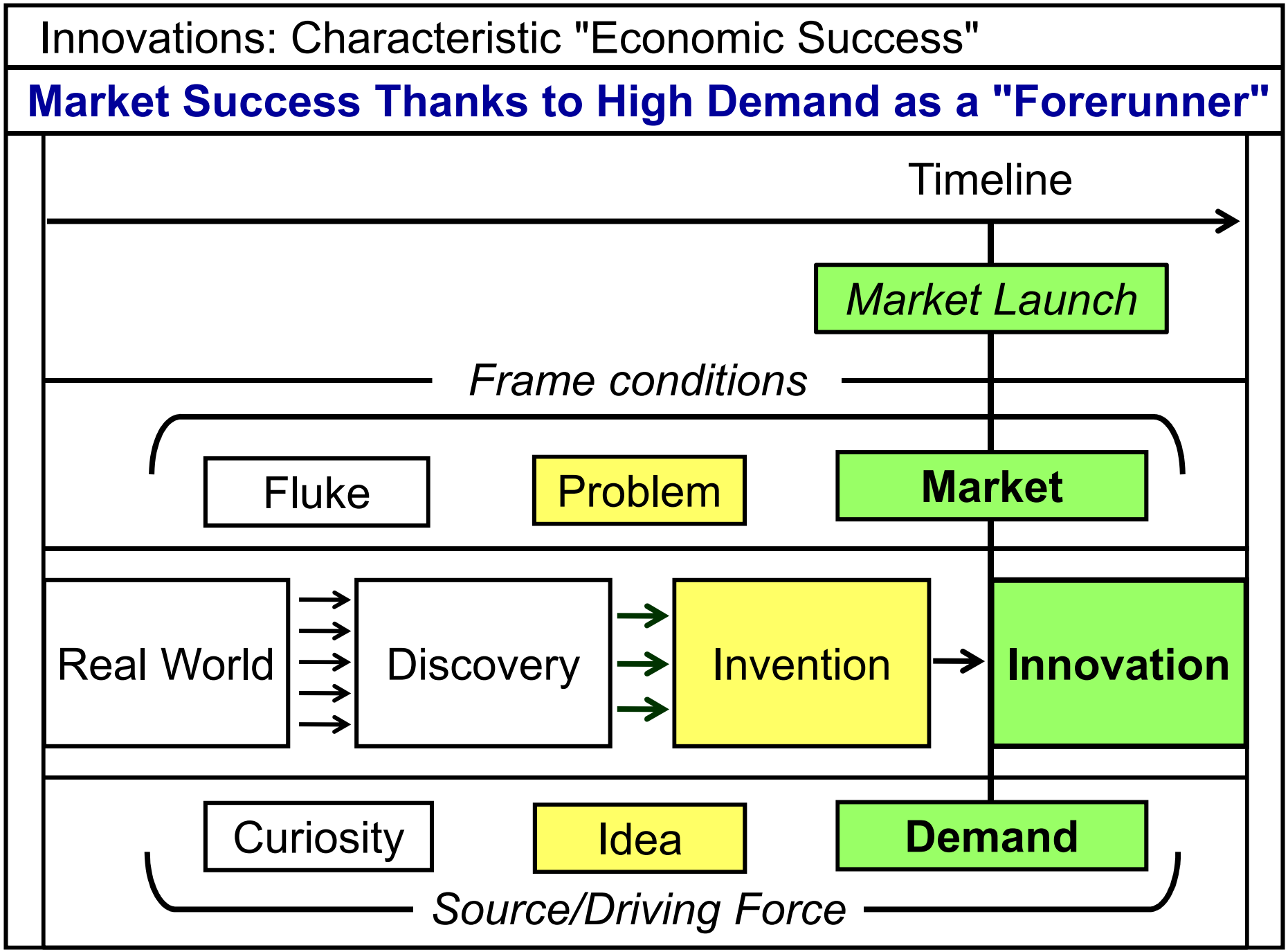
- **Rights of Membership**

  Participation in the shareholders general meetings.
  Voting right at the shareholders general meetings.
  Right of information/Right of controlling.

Innovations: Characteristics

Individual Features:

- Novelty, in contrast to the hitherto existing.
- Clearly discernible (technical) improvements.
- Inventions mostly provide their basis.
- Laborious, complex processes of emergence are typical.
- Visible or latent risks during the generation.
- "Maturity" is often necessary for "acceptance".
- "Suitable" points in time for market launch are required.
- Demonstrable advantages for the customers / users.
- Economic success for the "innovators".
- Decisions on the overall success (+/−): → Market.



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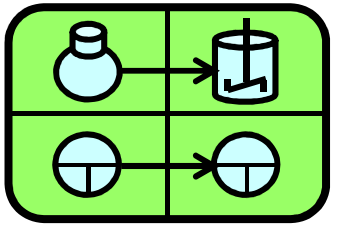
R&D Project Management
in the Chemical Industry



Information Material *for the subject matter:*
"Suitable" points in time for market launch.

See Supplement Module 2 for (Bio)Chemists (m/f/d)

"Juvenile Hormone Mimics to Control Stinging and Sucking Insects".

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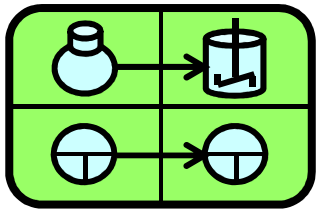
R&D Project Management
in the Chemical Industry



End of Lecture Module 01

Rainer Buerstinghaus