ENGINEERING MANAGEMENT

BME MSc Majors at Faculty of Electrical Engineering and Informatics
Economic and human themes, BMEVITMMB03

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ENGINEERING MANAGEMENT

as scientific discipline

Engineering Management (EM)

a combination of the *Engineering Sciences and Management Sciences*, a bridge between them concerning with the methods and methodologies – common in the engineering – to develop and manage processes, organizations, technologies and products.

EM on an engineering field: management processes of an industrial field involving the management of the development and applications of the technology as well as the innovation (incl. both technological and managerial) of a concerned professional area.

Here (in this subject) the concerned area is: *electrical and computer engineering*, particularly: *information and communication technologies (ICT), including internet, electronic and media technologies*.

SUCCESS IN WORKPLACES

Only about 20% of the graduated engineers is working in the R&D(&I), the others are **in entrepreneurship, project management, sales and marketing**…where the **management knowledge is indispensable**:

- the knowledge of business processes,
- the understanding of the market's mechanism,
- the practical application of the theoretical knowledge,
- the ability of self-management.

In engineering jobs due to a USA employers' survey:

1. Positive, professional work attitude (work ethics)
2. Communication capability:
   oral, written, computer literacy, English
3. Teamwork, cooperation readiness
4. Innovative way of thinking:
   problem-solving skill, critical way of thinking

TOPICS

Engineering management in Knowledge-based Economy

- Engineering management in general: roles and methods
- Strategic management: position analysis, direction statement
- Organization management: lifecycle and transformation of firms
- Knowledge management: use and protection of intellectual rights

ICT specific engineering management

- Technology management: use of ICT
- Innovation management: models, metrics, organizations
- Product management: development and marketing of products
- Operation management: business processes, customer relations

Regulatory environment

- Competition regulation, customer protection
- Regulation of the ICT sector: networks, services, market, content

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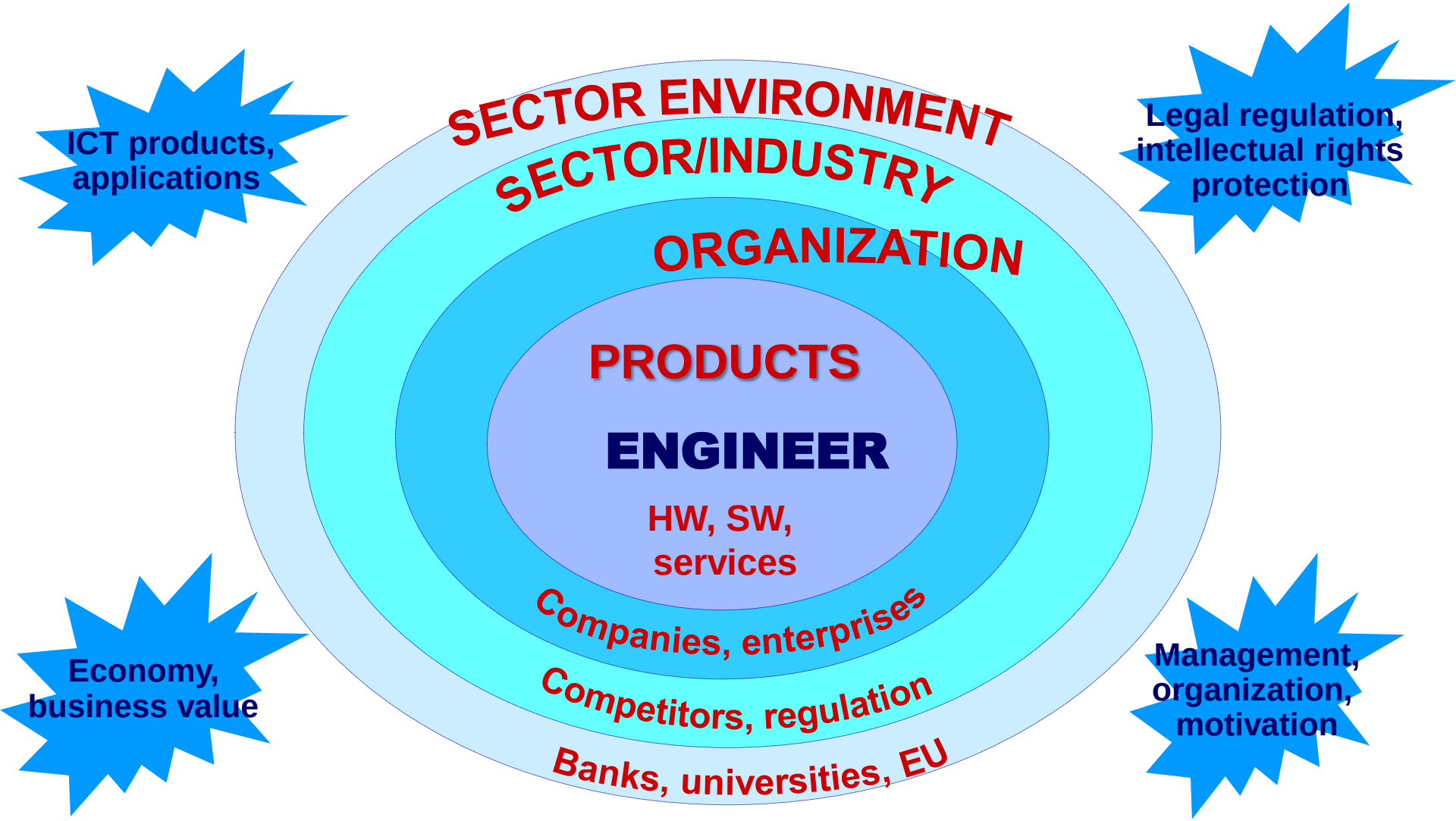
INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ENGINEERING MANAGEMENT



MARKET ENVIRONMENT OF THE ENTERPRISES

Typical *stakeholders* influencing the enterprises, their operation and results:

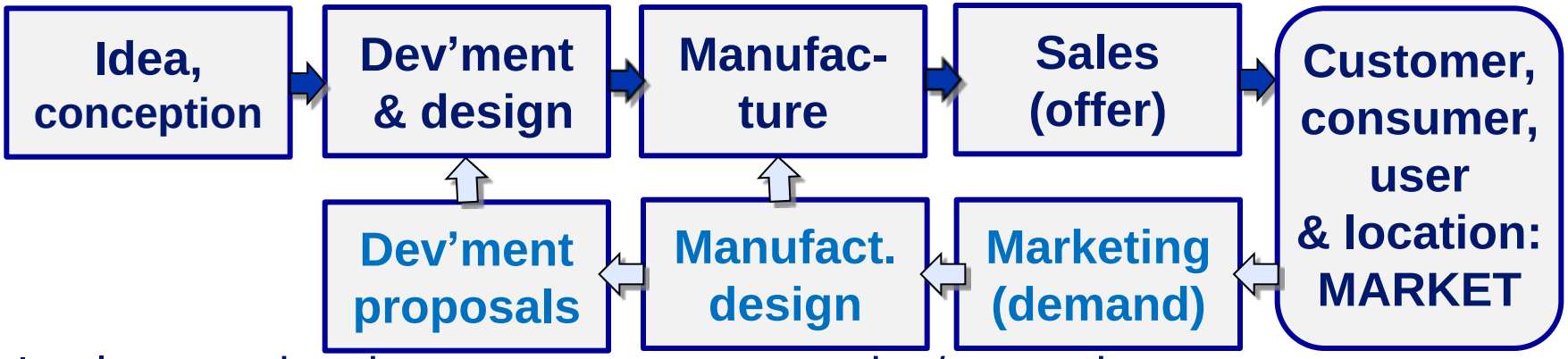
- Customers (demand, shopping power)
- Owners (state, private, national, multinational firms)
- Suppliers (offers, bargaining position)
- Competitors (threats, alliances)
- Cooperative business partners (alliances, subcontractors)
- Employees (knowledge, capabilities, attitude, atmosphere)
- R&D&I organizations (development opportunities)
- Financial organizations (financing, insurance)
- Administration (ministries, authorities, local governments)
- Media (press, R&TV, Internet, PR)
- Professional organizations (national, international, standards, representatives)
- Political parties (lobby)
- Consulting companies (head-hunters, marketing, organization…), and others

The enterprise influences its environment by **its own products.**

Product (hardware, software, services): can be bought on the market and generates benefits for the customer.

GOAL: PRODUCT / BUSINESS VALUE

Product Value-chain



Implementation: by one or more companies/enterprises

Principal factors of a product's success:

- **User benefits: function, price, quality, being user-friendly, customer service**
- **Technical parameters, patent**
- **Novelty, additional functions, intellectual innovation**
- **Compatibility, standardized solution**
- **Brand, design, extra feeling provided by the product**
- **Price-gap: relation of price and cost**

In 85 % of the cases the reason of unsuccessful product is the wrong market assessment.

Essential in ICT sector :
Convergence of Telecom, Informatics and Media (TIM)

based on the evolution of digital technology and internet

Specific costs have been decreasing for about 40 years:

Function	Specific, per bit cost
Storage	is halved by 2 years
Processing	is halved by 2 years
Transmission	is halved by 1.5 years

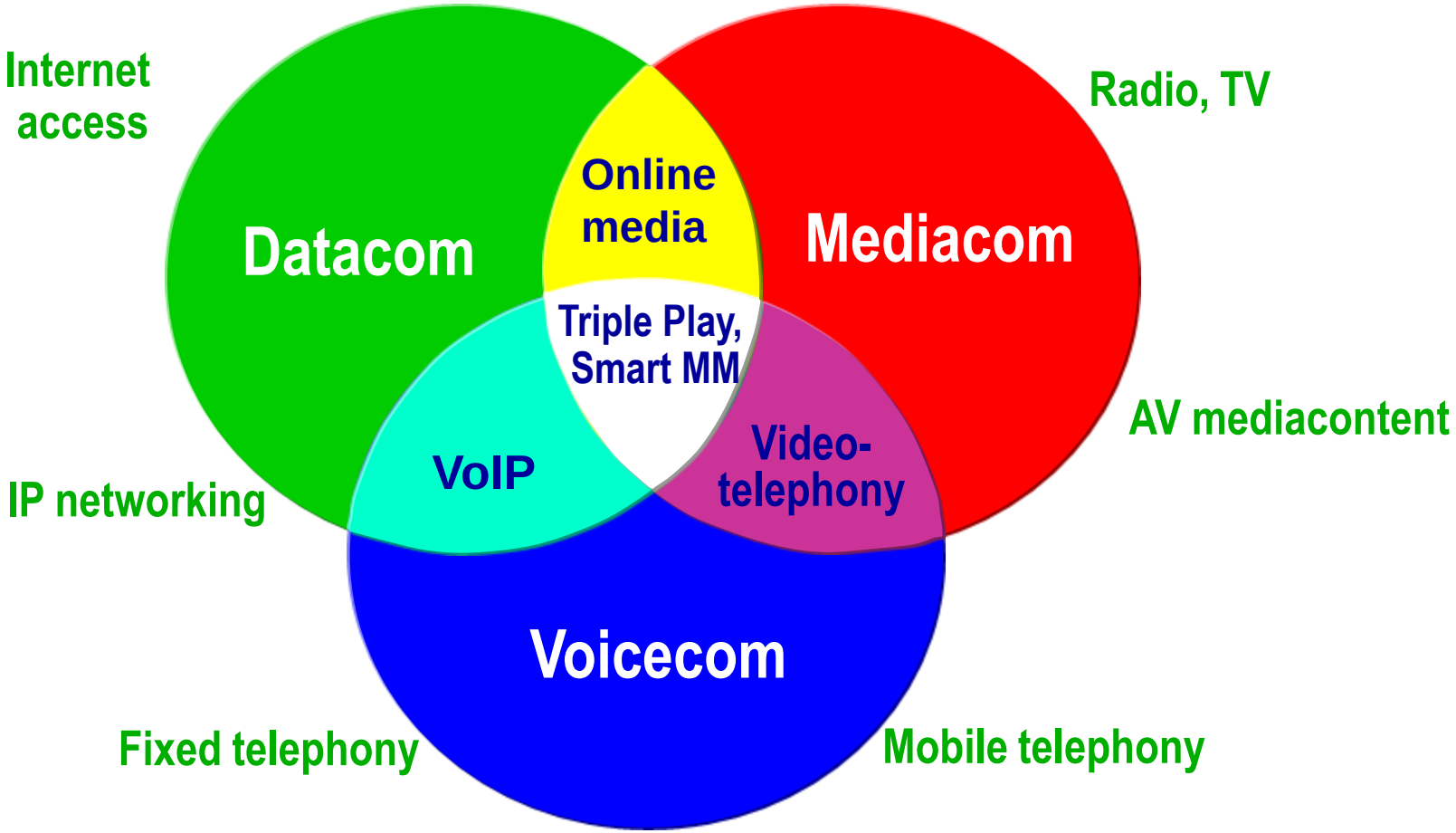
Common technology

- for all the three sectors (digital convergence)
- for different sections of their value producing process
- synergic combinations, intertwining value-chains
- integrated information value chain is implemented
- constitutes intelligent infrastr. of knowledge-based society
- convergence process is further widening

But: the future is essentially market-oriented, influenced by the success of the products; regulation can promote or hamper it

Convergence of Services

Convergence of voice, data and media communications provides new, synergic IP based multimedia service opportunities



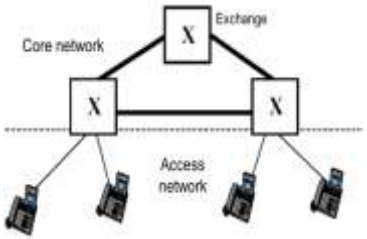
Phases of digital convergence

Steps of penetration of digital technology and Internet towards an integrated telecom, IT and media sector
Evolution of digital ecosystem

Digital ecosystem
- **Connecting things**
- **Expanding content space (sensors, gestures, 3D)**
- **Active involvment of clients, (social media, crowdsourcing)**

Analog world

Traditional telephony, datacom, broadcasting



1

Digitization and integration of network functions sector by sector

Communications sectors separated by content

2

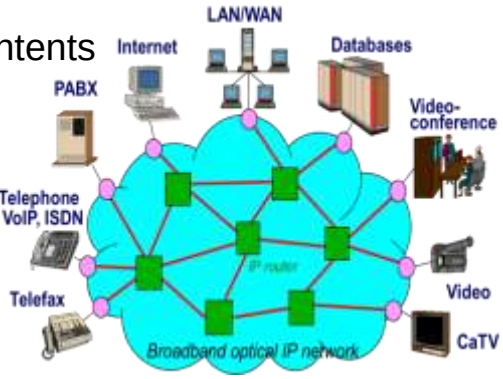
Integrated, uniform digital communications (IPv4/TCP) of various contents

Electronic communications sector

3

Convergence of communications, information processing and content handling: Synergic IPv4/TCP based MM applications

Infocommunications (ICT, TIM) sector

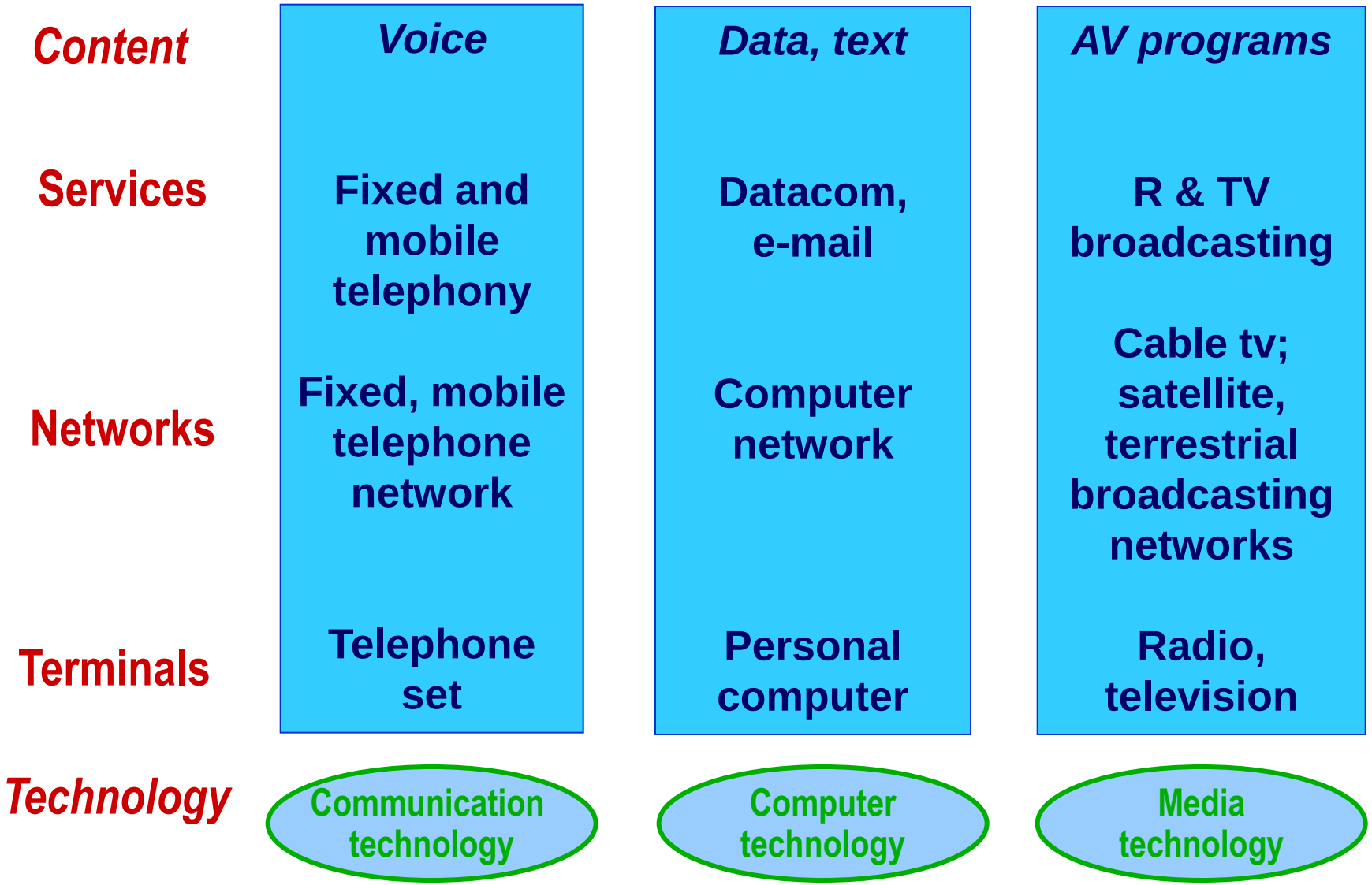


4

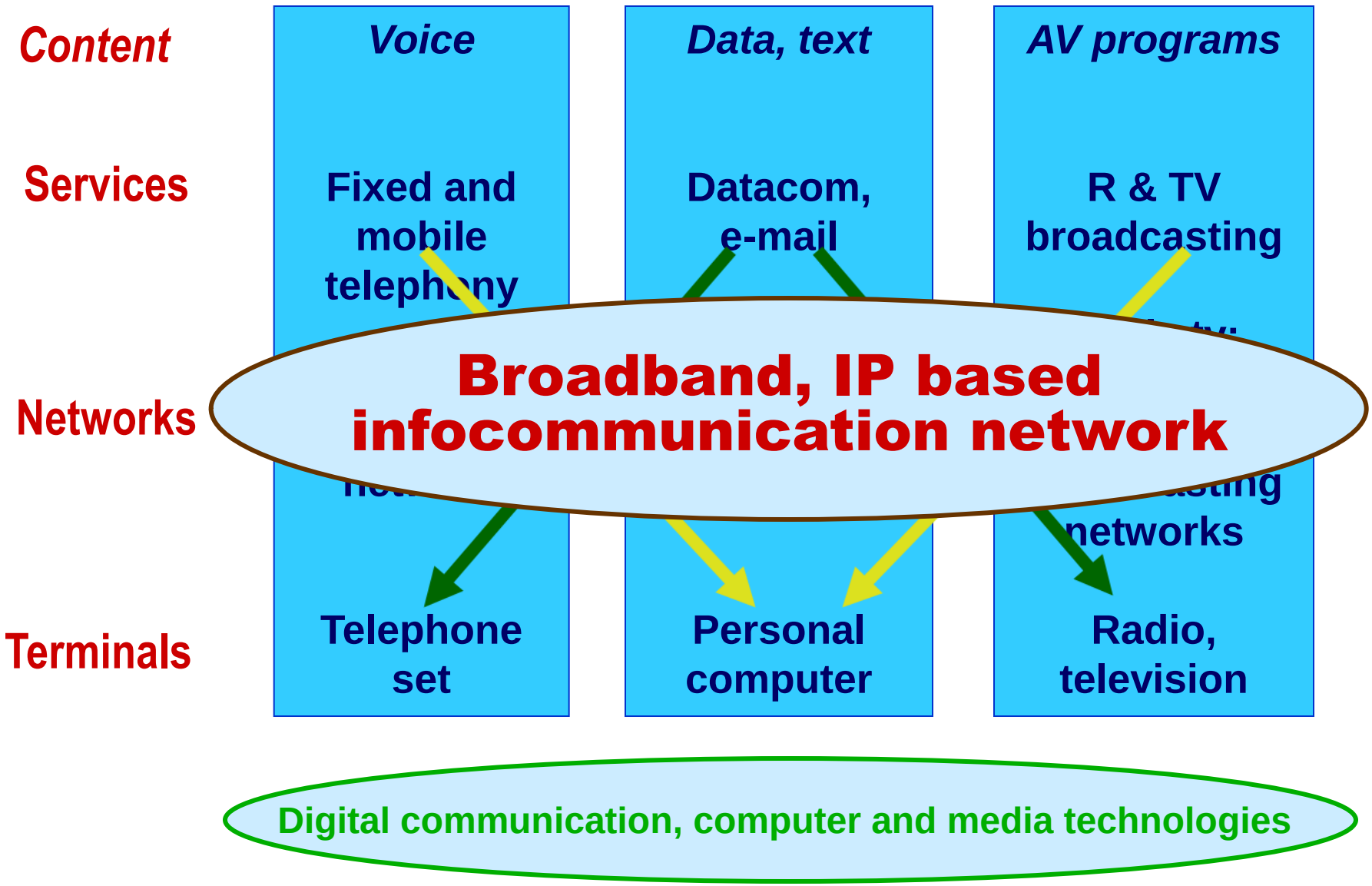
It transforms business and bank spheres, administrations, health, transport, education, knowledge systems, our every day life: Future information and communication society, Digital Age is Internet-based, but limitations of current Internet must be eliminated : Future Internet

Engineering Management 11 Sallai Gy. Kuinság

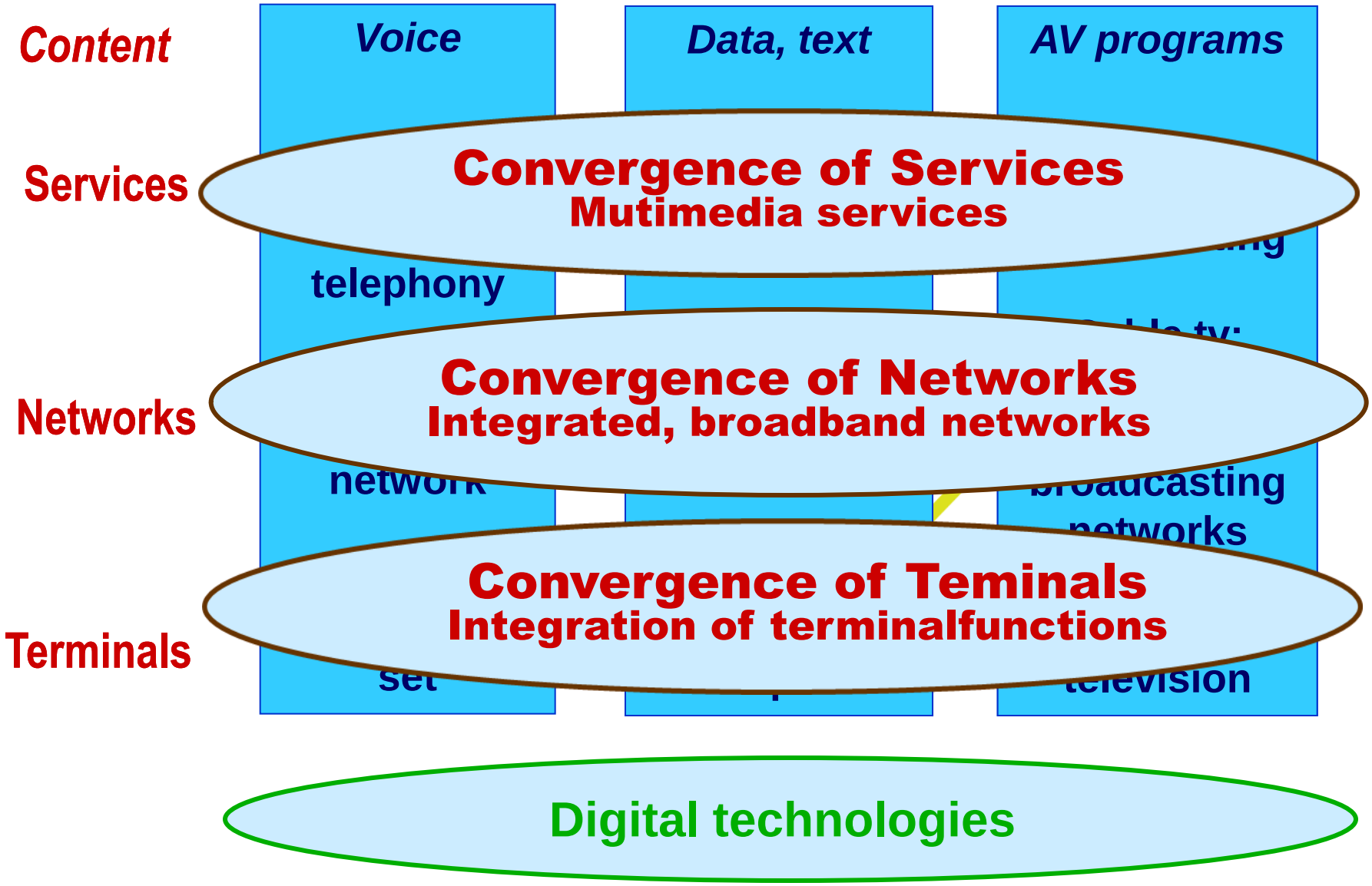
Traditional value chains: various contents – separated services, networks, terminals, markets and regulations



Convergence of Networks

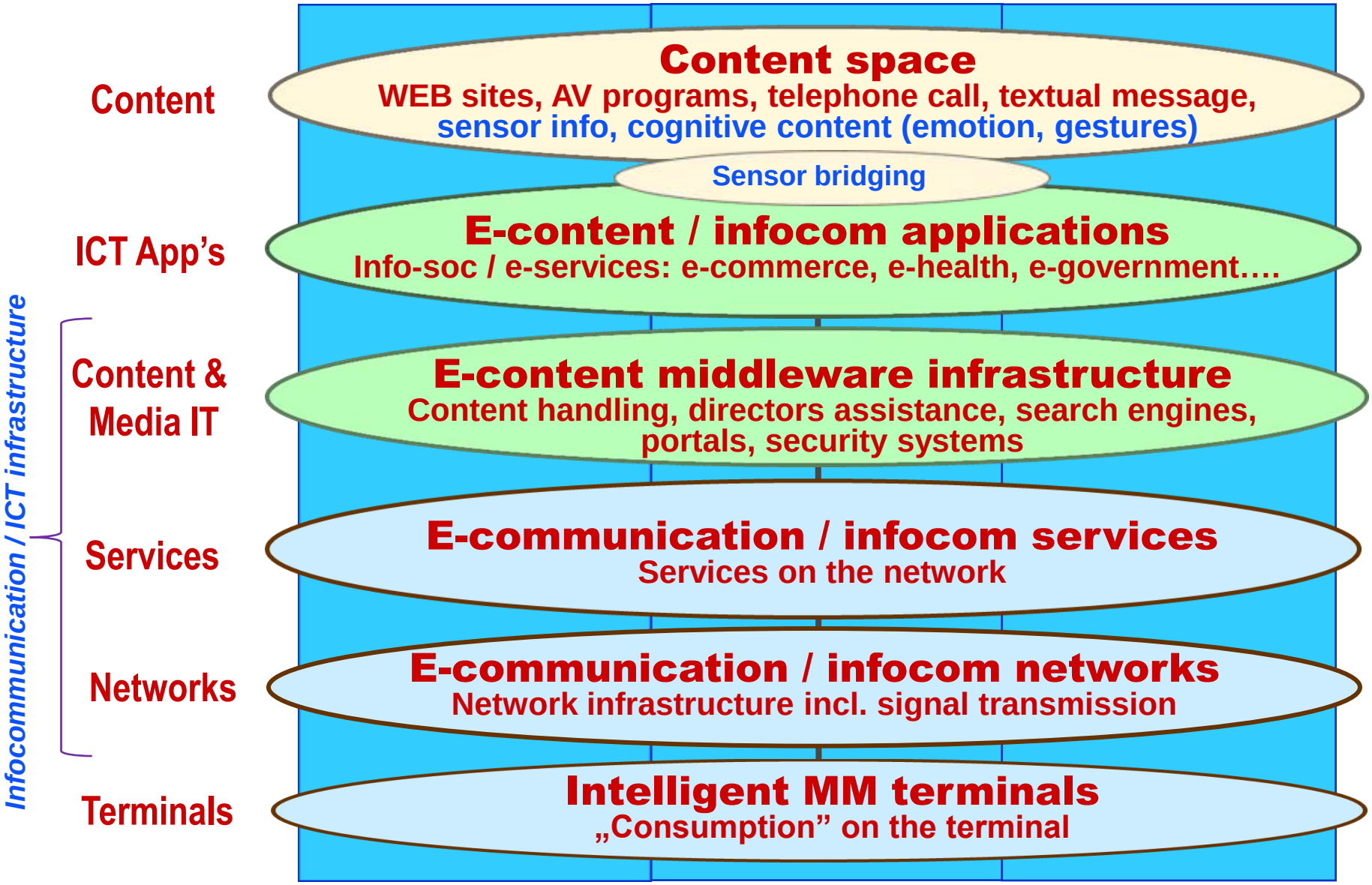


The intertwinning of traditional value chains results in various horizontal convergence forms and integrations

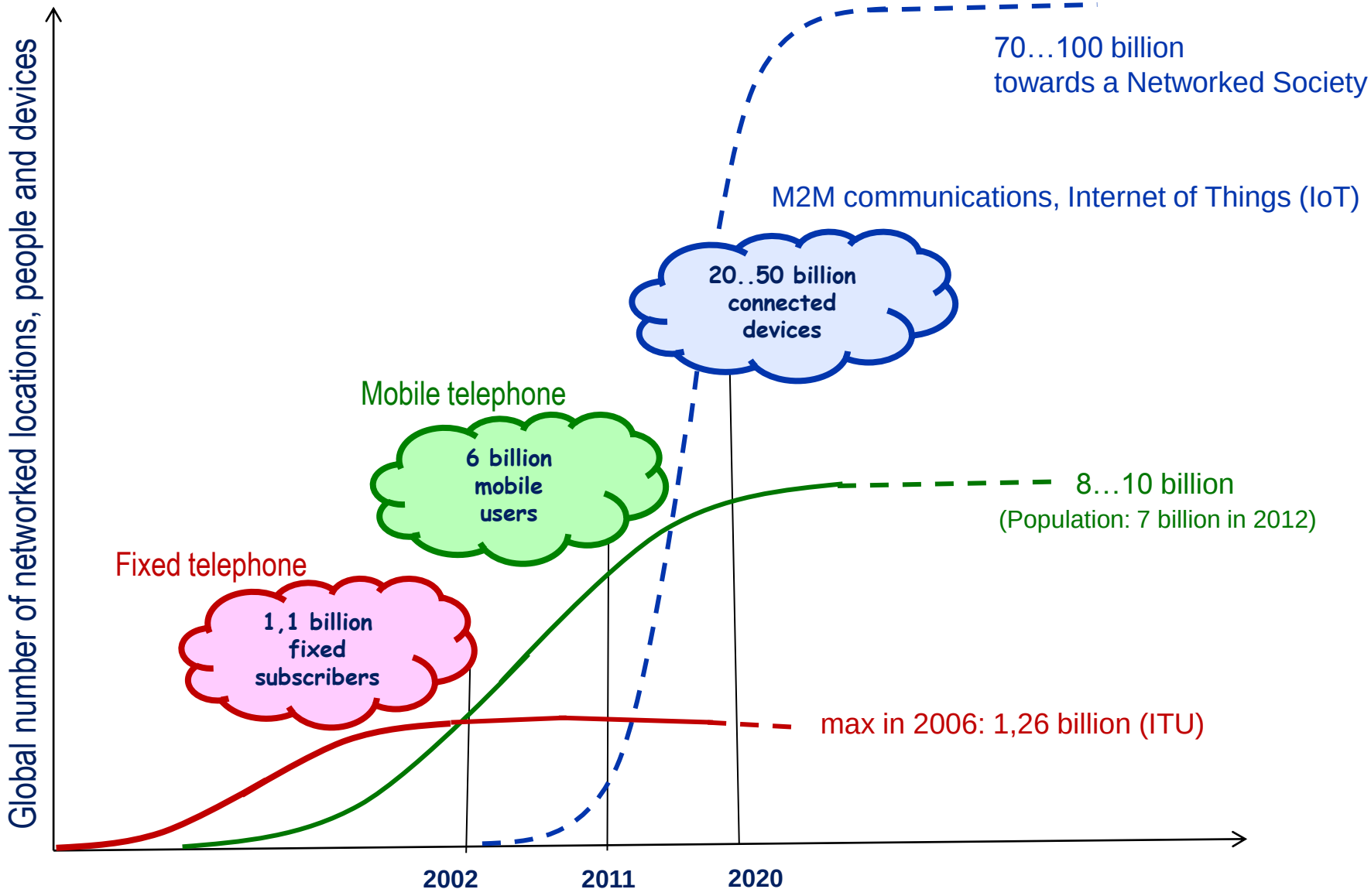


Integrated information (TIM) value chain

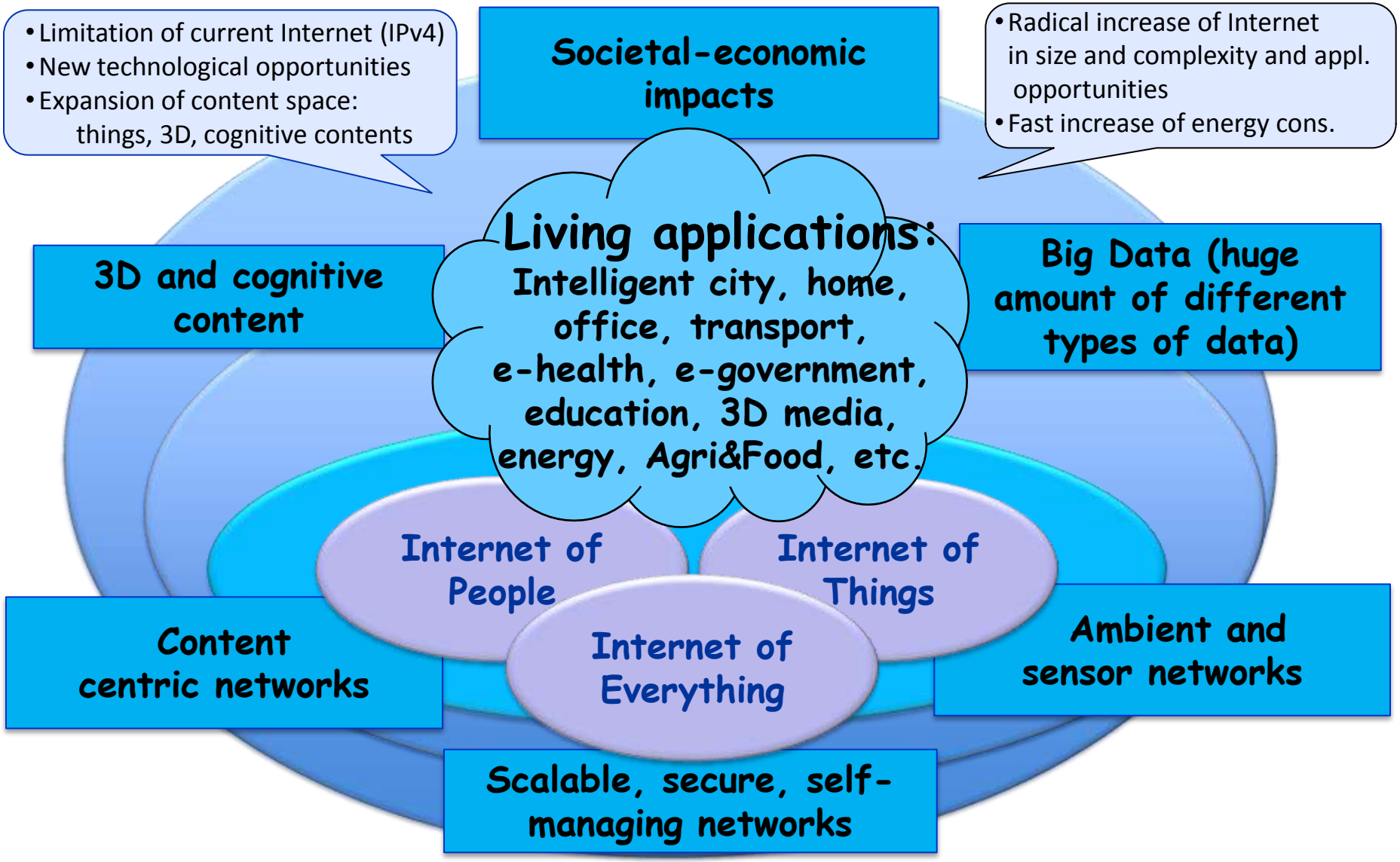
The layers of intelligent, digital infrastructure of information society



Evolution of Networking



Concept of Future Internet Research



Based on NiCT FI vision, FIA2011 in Budapest and Poznan, FIA2012 in Aarlborg and FIA2013 in Dublin

Relevant Future Internet Functions

1. Identification and interconnection of things, devices, sensors (Internet of Things)
2. Mobility: „anywhere, anytime” data collection and presentation
3. Networked databases: real time access and global handling of big data (huge scale multimedia contents)
4. Content based searching, content mining
5. Managing 3D and cognitive contents, virtual world
6. Localization, tracking and tracing
7. Information security, personal data protection
8. Customized solutions and presentation (personal profile)
9. Managed quality, service and application orientation (platform)
10. Cloud computing and communications, software, platform, infrastructure, network as a service
11. Remote collaboration, monitoring and control of physical processes (Tactile Internet)

Levels of digital (TIM) convergence

3. REGULATORY LEVEL
Harmonization and globalization of regulations

2. MARKET LEVEL
Integration of product markets, alliance and fusions of companies

1. TECHNOLOGY LEVEL
Uniform systems and platforms

Digital (TIM) convergence transforms business and bank spheres, administrations, health, transport, education, knowledge systems, our every day life

Limitations:
- investment, R&D&I demand
- legal restrictions
- lack of market experience
- lack of professional knowledge

Engineering Management BMEVITMMB03

BME Faculty of Electrical Engineering and Informatics, MSc EE and IT Majors

Economic & human themes

AIMS, COMPONENTS AND DIMENSIONS OF MANAGEMENT ACTIVITIES

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Budapest, spring of 2018

MANAGING ORGANIZATIONS

Managing organizations means to set up and implement *organizational targets* successfully, including:

- **determination and solution of tasks (what and how to do?)**
- **obtaining and usage of resources (with what?)**

Organization: activities arranged into a structure, formal relations:
company, institute, government body, civil society, …

Targets: quantitative, qualitative (changes, time-scale)

Tasks: operative and strategic (who, what, why, by when, how?)

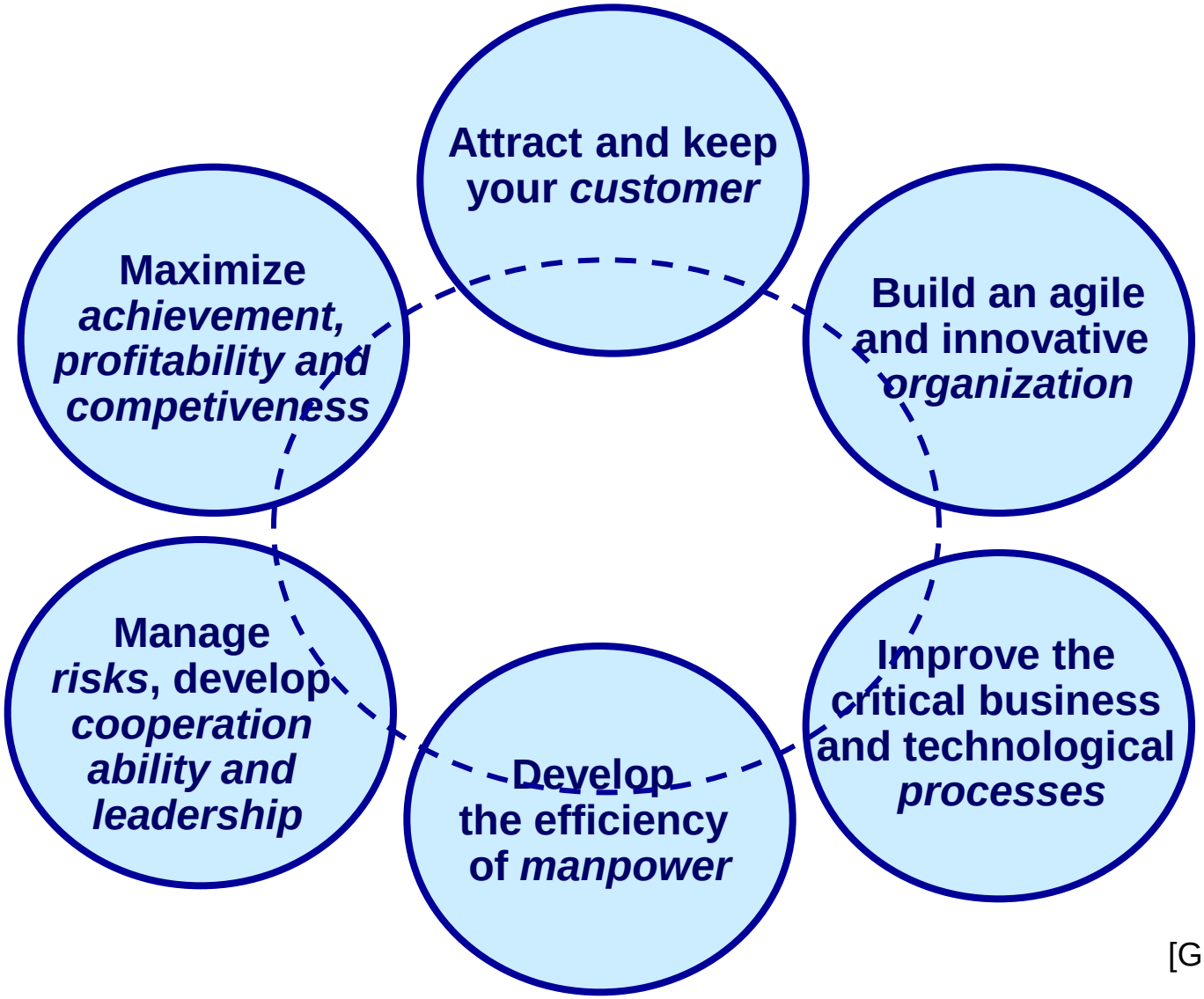
Resources: material (matter, devices, assets, environment …),
human (manpower, knowledge …)
financial (cash, stocks, bonds, credit …)
special (frequency, identifier …)

Concisely: ***to achieve organizational objectives successfully***

- in business man't: ***business success***

- in engineering man't: ***innovation success, the success of technologies, products and organizations***

Mandatory business priorities of managers



[Gartner]

CHARACTERISTICS OF MANAGEMENT:

- ***Organization dependent:*** **the type, size, state and owners of the organization**
- ***Environment dependent*****: legal, economic, institutional and market situation (competition or monopoly, conjuncture or recession, …)**
- ***Position dependent:*** **the level and character of the managerial job (team leader …. CEO)**

- ***Systematic:*** **regular procedures, several routine and customs**
- ***Relatively unstandardizable*****: individual matters and decisions**
- ***Limited rationality*****: necessary to make decision in lack of information, knowledge, time**

- ***Complex:*** **technical, economic (financial, organizational), legal (laws, regulations) human (psychology, sociology)**
- ***Evolving and adaptive*****: learning, growing experience, change of circumstances**
- ***Duality:*** **combining retention and change in the organization (to keep traditional values and create novel values)**

COMPONENTS OF MANAGERIAL ACTIVITY

From team leader to chief executive officer (CEO)

„The 7 caps of managers”

Taking care of people
(teaching, consulting, aid, coaching, evaluation…)

Communication
(oral, written, emotional, image, contacting, negotiation, …)

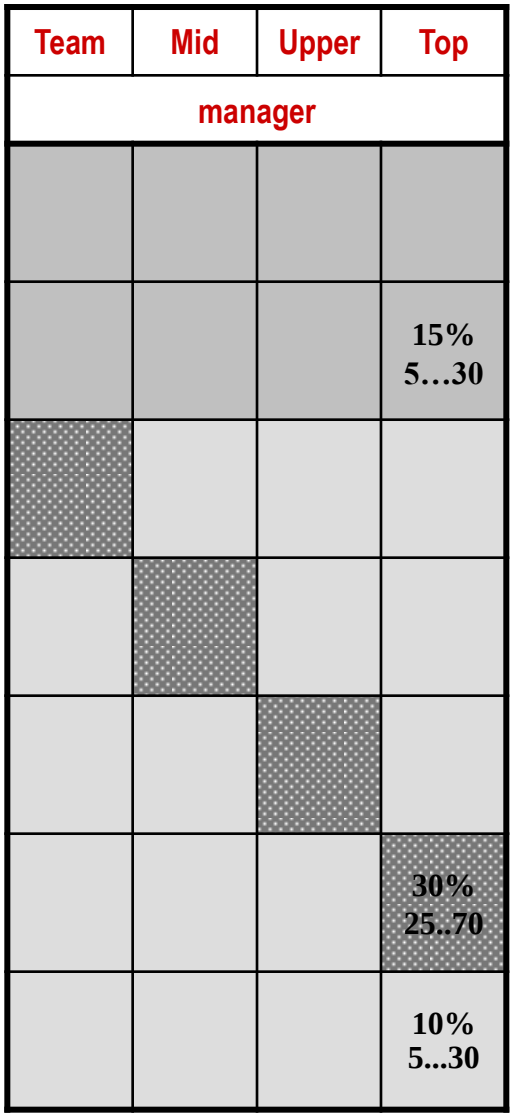
Action
(things to be done, workload and conditions…)

Administration
(planning, conciliation, reporting, performance certificates…)

Business, entrepreneurship
(obtaining business, business development, achievements …)

Direction
(targets, focusing, change over, undertaking responsibility …)

Anxiety
(deadlines, budgets, changes; contingency handling..)



MANAGEMENT: executes organizational targets *successfully*

SUCCESS-FULNESS	Effectiveness	Efficiency
Short-time, at present	**P** **PRODUCTIVE** **Performance** (fulfil demands, functions)	**A** **ADMINISTRATIVE** **Systematization** (organize, regulate)
Long-time, in future	**E** **ENTREPRENEURIAL** **Proactivity** (foresight + venture)	**I** **INTEGRATIVE** **Cooperation** (team building)

PAEI ability in the management team!

Contribution of company's functions to successfulness

SUCCESS-FULNESS	Effectiveness	Efficiency
Short-time, at present	**P** Manufacturing Operation Sales Service	**A** Accounting Informatics Rule making Organization
Long-time, in future	**E** Marketing R & D & I Entrepreneurship	**I** HR management Managerial culture Strategy

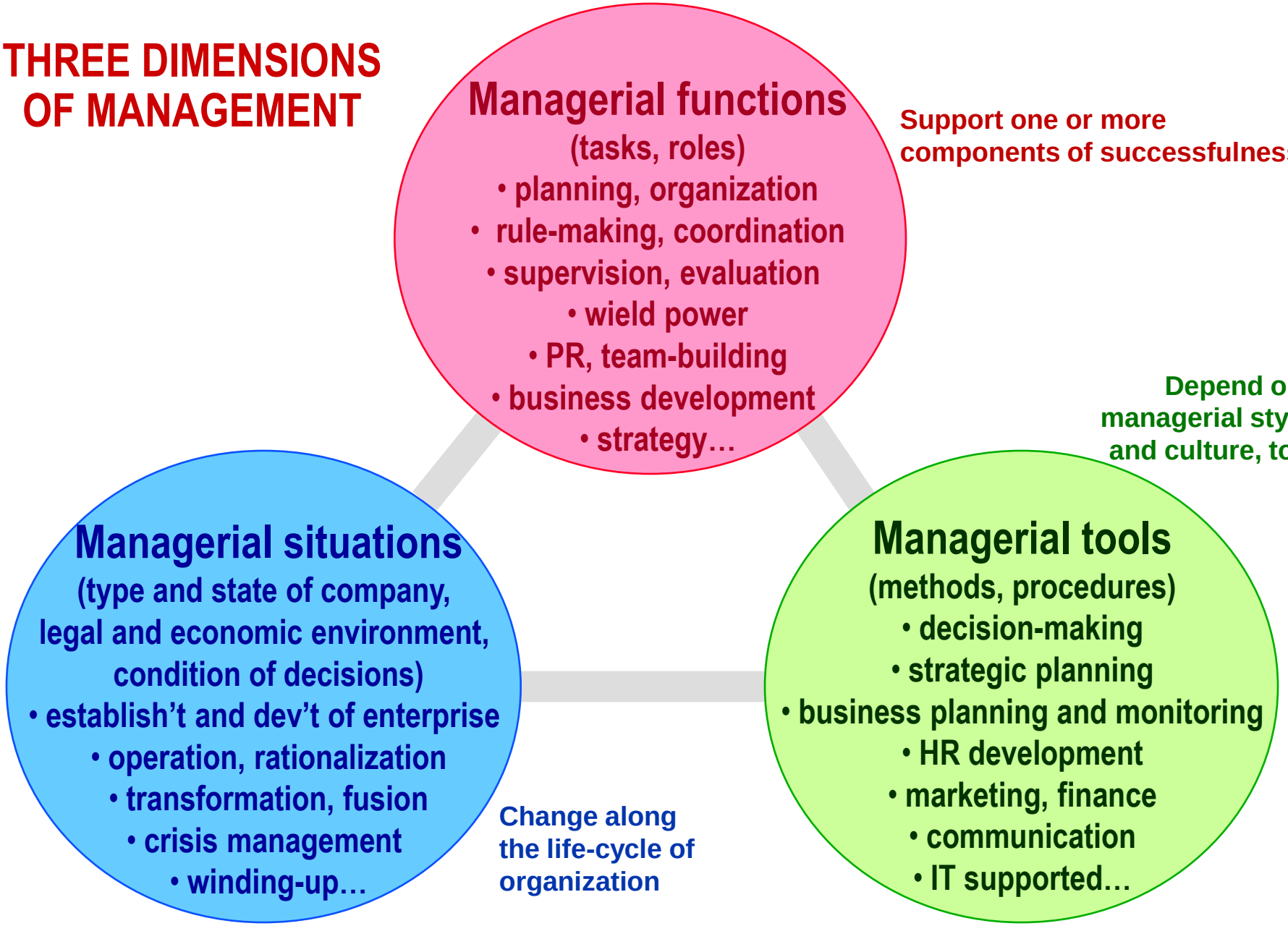
PAEI ability in the management team!

Self-assessment: our strengths and weaknesses

SUCCESS-FULNESS COMPONENTS	Effectiveness	Efficiency
Short-time, at present	**Pp-** **PRODUCTIVE, FUNCTIONAL** Achiever	**Aa-** **ADMINISTRATIVE, RULE-MAKING** Organizer
Long-time, in future	**Ee-** **ENTREPRENEURIAL, PROACTIVE** Entrepreneur	**Ii-** **INTEGRATIVE, COOPERATIVE** Team builder

PAEI ability in the team!

THREE DIMENSIONS OF MANAGEMENT



SOME SIMPLE MANAGERIAL TOOLS

Pareto method: classification of factors/to do list elements according to their importance (A, B and C): few important A, more less important B,....

PEST/STEP method: structuring for macro investigation: separation of political (P), economic (E), social (S) and technical (T) aspects. Lately legal (P), demographic (S) and environment aspects are also identified and separated.

Six thinking caps method (Edward de Bono):
to promote parallel way of thinking (everybody approaches the same topic from each side), to arrange discursive ideas:

- White cap: alignment of facts, data, without emotion
- Red cap: emotions, feeling, affective aspect
- Green cap: creativity, collecting ideas, alternatives, opportunities
- Yellow cap: looking for values, benefits, positive side
- Black cap: identifying threats, difficulties, critical aspect
- Blue cap: global, overall way of thinking; harmonization, summing (wrap) up

The order of caps is not fixed, return is possible.

Work-style analysis: Vogelauer's wheel method

He/she comprehends the whole, prefers lucidity, thinks in interrelations

Generalist

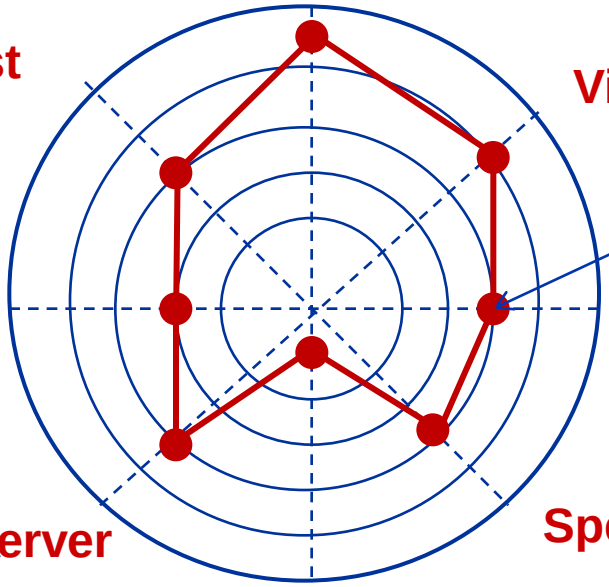
He/she actively approaches the things, catches the opportunities

Initiator

He/she pays attention, what happens or may happen in the future, is open to new

Visioner

Evaluation between 0 and 5



He/she strives for order, precise, exact, prepares schemes, takes regulations, builds on logics

Systematiser

Intuitive

He/she watches the course of events, flexible, creative, spontaneous, emotional, needs free spaces

Preserver

He/she looks back with pleasure, trusts on the reached results, consider them as a reference, tries to preserve the existing things

Conformer

He/she adapts, obeys, acts only for request, let somebody to decide

Specialist

He/she is interested in details, observes the small mistakes, corrects, improves, uses more times for an activity

What is my boss / colleague / a research fellow / a project manager like?

He/she comprehends the whole, prefers lucidity, thinks in interrelations

Generalist

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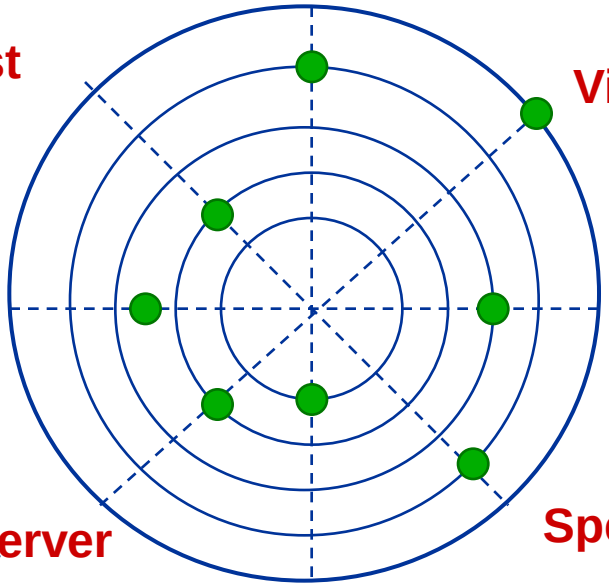

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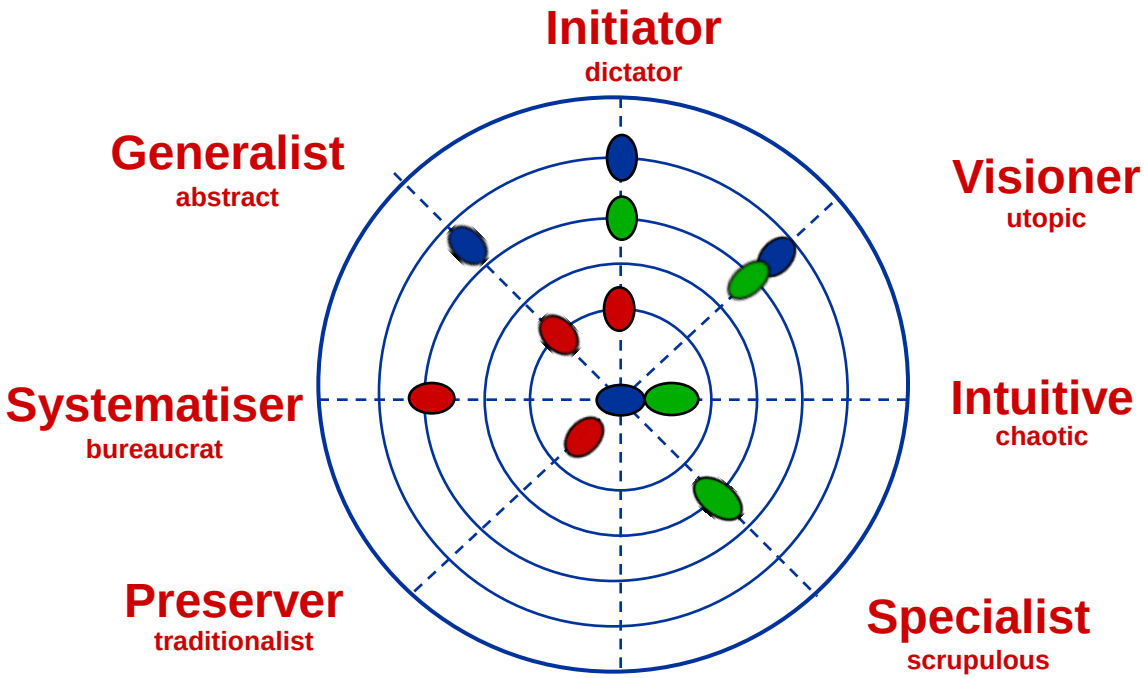
Vogelauer „wheel” work-style analysis: evaluation

Opposite pairs are along axis, their subtraction measures their *balance*.
Highest values are extremes: dictator, utopist, chaotic, scrupulous, passive…
Application: Own wheel (self-image), for fellow-student, friend (mirror-image)
Aim: personality development (diagnose, direction setting), team building



Example:

- *Technical research fellow*
- *Project manager*
- *Top manager*

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Economic & human themes

STRATEGY AND STRATEGIC MANAGEMENT

Corporate business strategy

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BME Dept. Telecommunications and Media Informatics

Budapest, 2018

WHY IS STRATEGY NEEDED?

➢ DIRECTION OF AN ORGANIZATION

- management in labour division, delegation of decisions
- prescribed command may not be for every case (changes!), therefore:
  - ➡ corporate principles, philosophy to polarise decisions
  - ➡ corporate values: “when do you do well”.

Where are we going to ?
How do we approach matters ?
What are our priorities ?

➢ CHANGE MANAGEMENT

- Recognize trends, observe the changes of your environment
- Have to able to manage the changes
- Exploit the new possibilities (new demand)

Avoid „boiled frog effect”, you must step, even if the things go well

➢ LONG-TIME SUCCESSFULNESS (paEl)

- What and how do we change for the success? (Vision)

GENERAL DEFINITION OF STRATEGY

Strategy is a *consistent entirety* of determinations, that constitutes a *comprehensive whole*, and sets:

- longer term organizational *targets,*

- *the way* to reach them,

- *priorities.*

Strategy departs from the wished future status, it does not project present to future, but initiates actions in present !

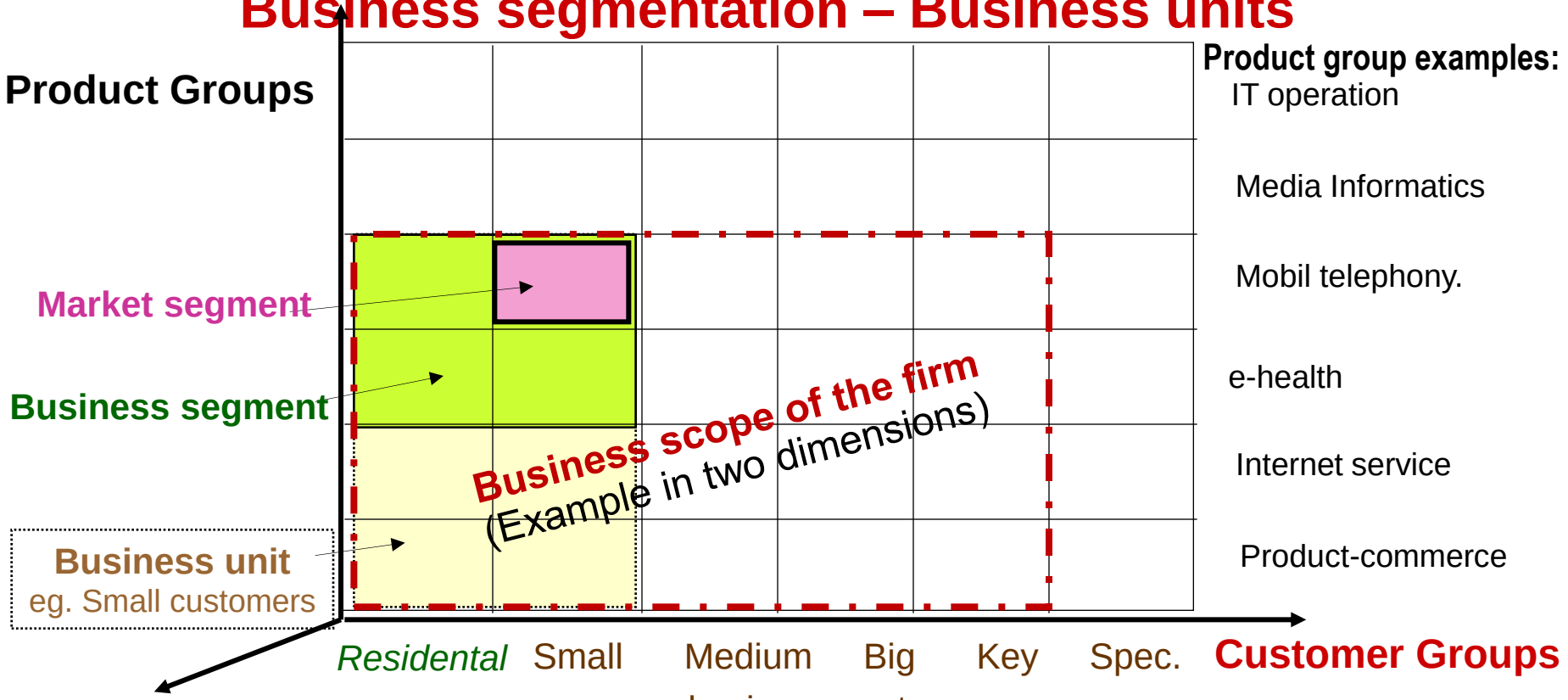
Atributes:- well-established (based on external, internal analysis),

- robust (steady, stable),
- lucid (clear for all concerned persons),
- accepted by the key managers (undertaken),
- realizable

Any organization, company, enterprise, institution, government, university, bank, association, party etc. can have strategy.

We deal only with business or competitive strategies.

Understand the Market:
Business segmentation – Business units

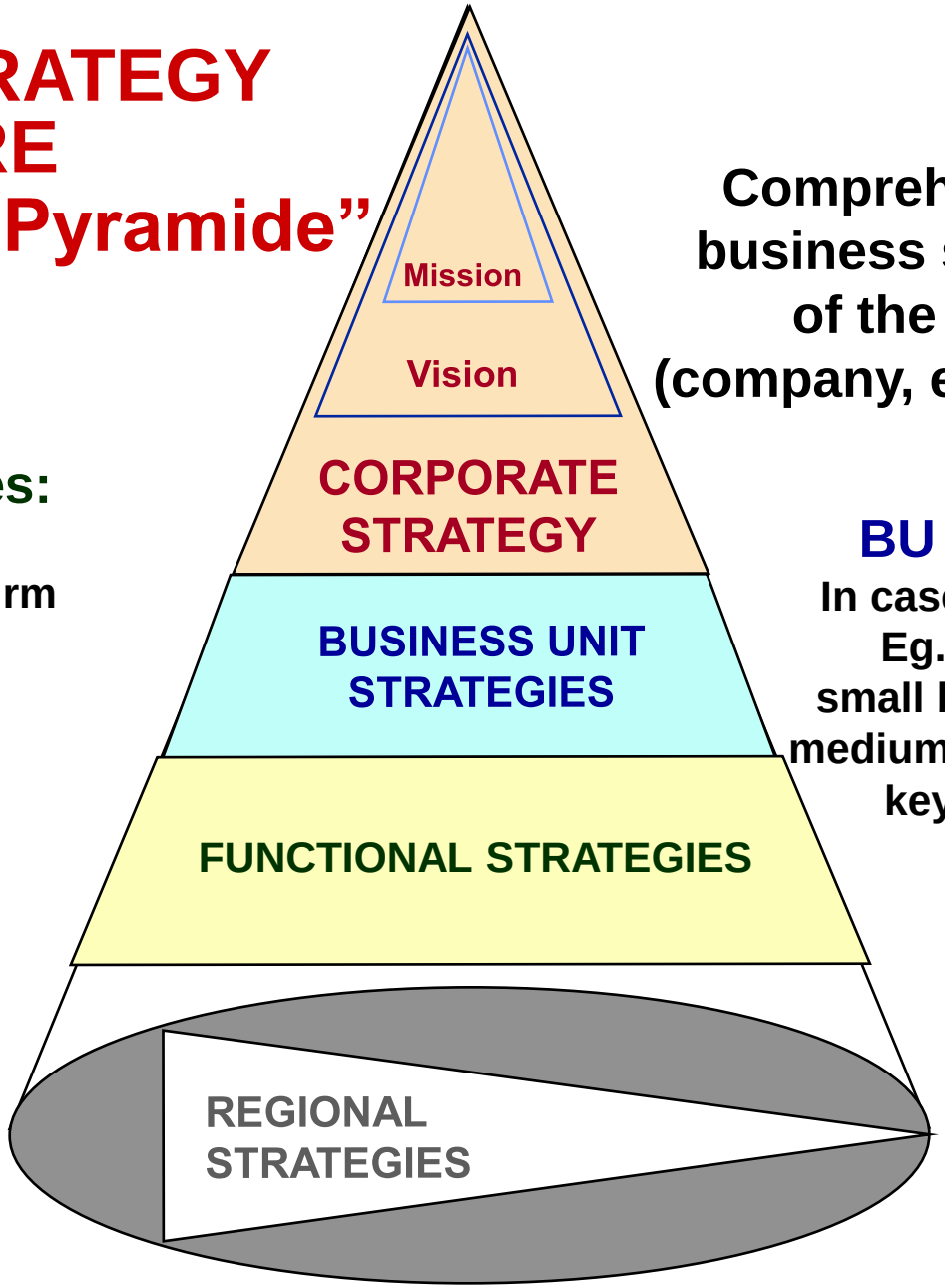


Market segment: section of defined customer and product groups

Business segment: market segments with homogeneous business strategy

Business unit (BU): stand-alone organization unit, consisting of market units with same general strategy (typically: profit centre) („strategic" adjective can be added: SBU)

BUSINESS STRATEGY ARCHITECTURE „The Strategic Pyramide”



Comprehensive business strategy of the firm (company, enterprise)

Functional strategies:
Depending on the type and size of the firm
Eg.: financial, human, marketing, technological, procurement, operation

BU strategies:
In case of more BU-s:
Eg.: residental, small bus. customers, medium bus. customers key customers

Regional strategies
Country-wide and multinational companies

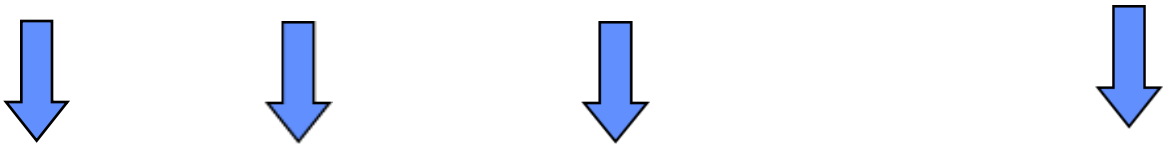
MISSION

The most concise formulation of the corporate strategy:

The reason of the existence of the firm:

Why are we all over the world? Our major ambition

What, to whom, where, how does it provide?



Product group ***Customer group*** **Geographic area** ***Competitive advantages***

Dimensions of the business scope - pillars of lasting successfulness

- special competence
- technology, R&D, quality

The expectation of stakeholders is presented in harmony, in **emotional** way,
it mainly speaks to the employees, but it also is a message to the world.

Company, association, university, government and an individual may also have.

The *corporate slogan* is not mission, but a personal motto can operate as a **mission.**

VISION (in time):

Where do we go to, where do we desire to get?

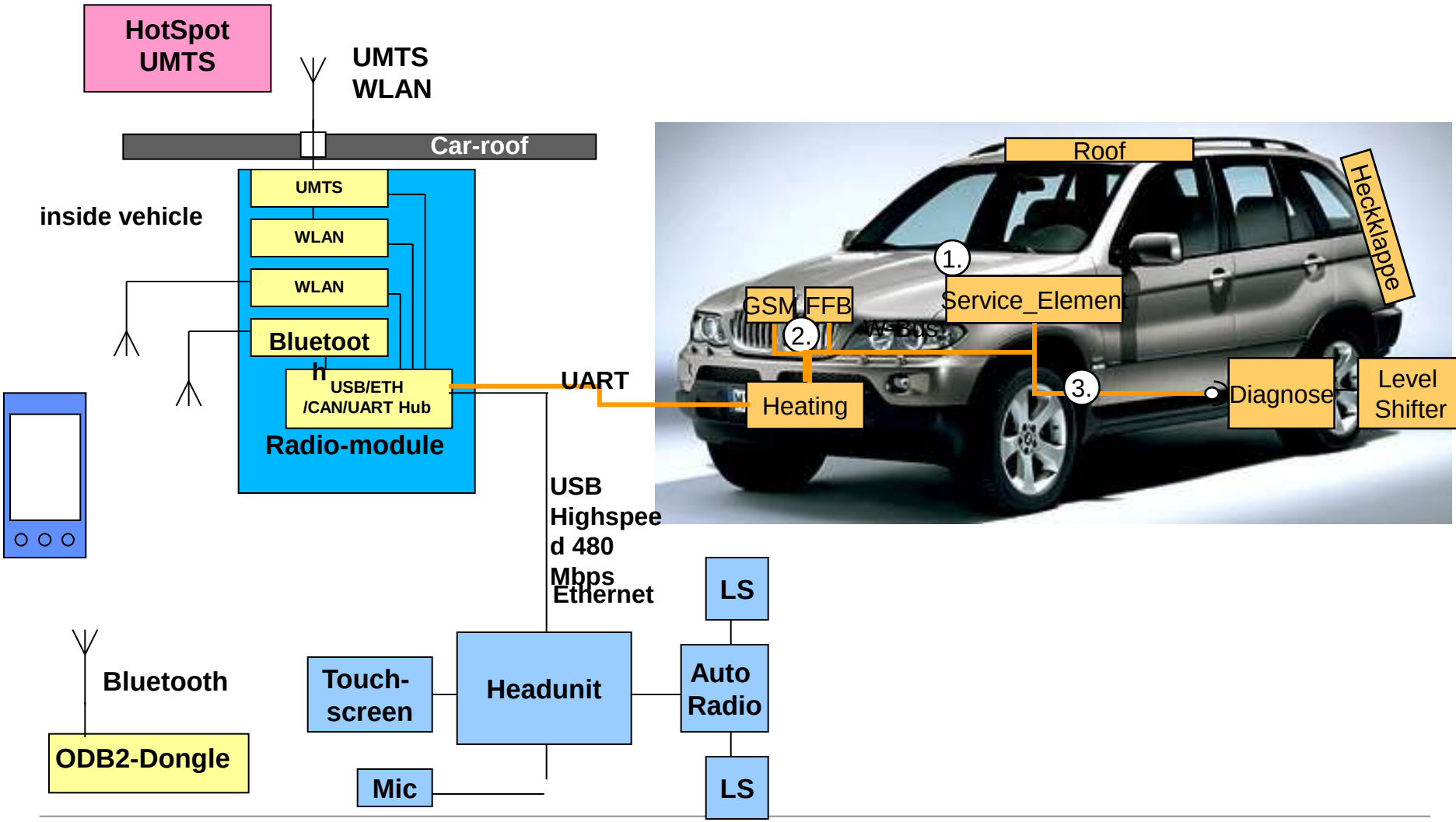
Declaration of the desired real future status, the major targets, values and priorities. Various formulations are from the essence to the deep corporate philosophy. **Possible parts:**

- **(Mission)**
- **Business/professional/scientific/development focus, target**
- **Comprehensive performance aims:** criteria of success
- **Corporate priorities:** strategic business units and positioning
- **Corporate values:** customer-orientation, teamwork
- **Corporate policies:**
  - **Horizontal strategy:** synergies between SBU-s
  - **Vertical strategy:** integration, widening / narrowing
  - **Relation to the players of the corp. environment:** striving for cooperation, fusion, acquisition

Business policy **is an externally communicated, less detailed vision.**

Vision of a wireless in-vehicle radio-node

PRETTL electronics



CORPORATE STRATEGY

Comprehensive business strategy formulated at corporate level

1. Vision

2. Strategic posture on the way there, the **e**ssence of strategy

What and how must change? Thrusts, guidelines:

- to attain the vision,
- to exploit the business possibilities,
- to avoid threats,
- to improve value-creation capability, etc.

➢ strategic scenarios, directions, steps, phases, critical things to be done

➢ quantitative and qualitative measures, milestones (corp. level)

➢ BU and functional directives, success factors, responsibilities

3. Portfolio management (for implementation)

ratios and priorities of the allocation of financial, human etc. resources

4. Organization management (for implementation)

organizational structure, managerial methods, promotion,
IPR and innovation handling, etc.

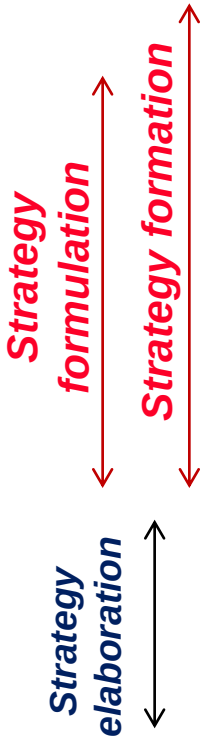
STRATEGIC PLANNING

Process and steps of planning

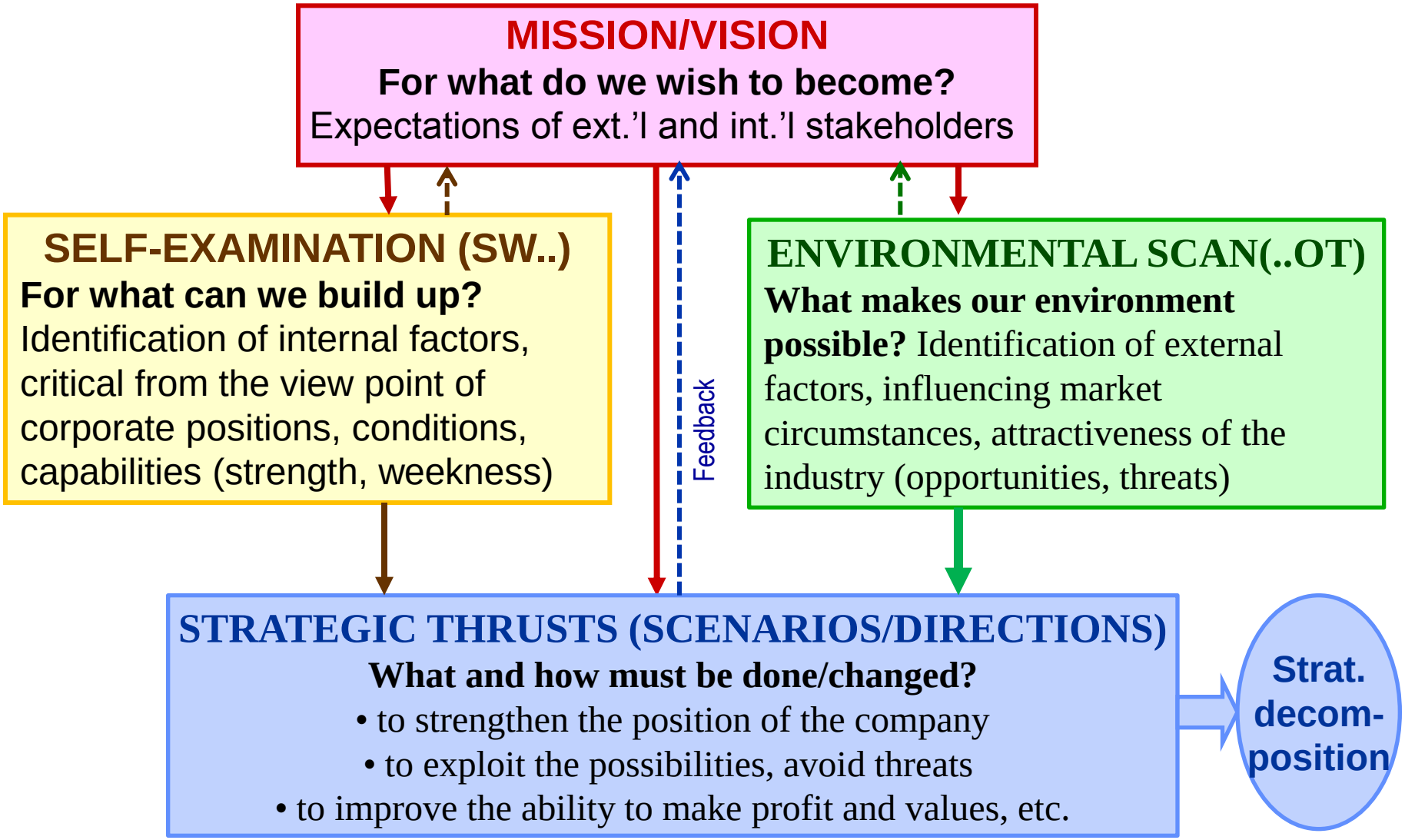
C 1 Mission, vision, business areas, expectations
C 2 ***Positioning*** **(SWOT: strengths, weaknesses, opportunities, threats)**
C 3 ***Strategic posture*** **(scenarios, directions, milestones)**
B 4 Mission, vision, action plan for each BU
F 5 Target, action plan for each functional unit
C 6 Feedback, harmonization
C 7 **Resource-allocation and organization development: priorities and indicators of execution**

BF8 Detailed BU and functional action programs
BF9 Financial planning: BU and functional plans
C 10 Checking and acceptance of plans

C = Corporate level
B = Business unit level
F = Functional level



ESSENCE OF STRATEGY FORMATION (C2-C3)



POSITION REVIEW – POSITIONING

Self-examination (SWot)

Internal scrutiny, value-chain analysis

identification of *organizational* strength and weakness of the strategically examined business unit, product or technology
(What are the critical factors? For what can we build up?)

Environmental scan (swOT)

Competition analysis

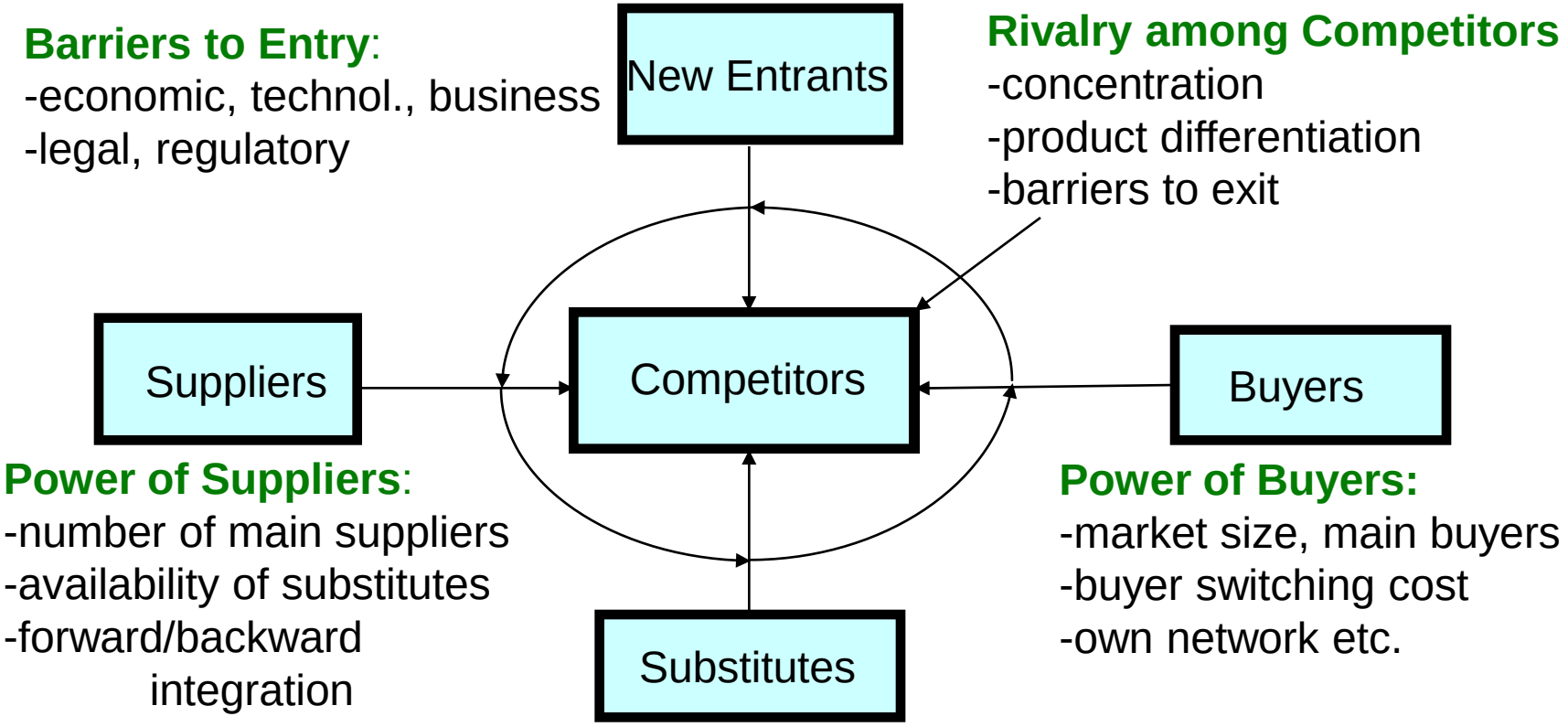
identification of the *competitive* opportunities and threats presented by the broader environment of the strategically examined business unit, product or technology
(What about the demands and competitors?)

Portfolio analysis

summary and evaluation of the position reviews made for business units, products or technologies

Competitive Analysis

M. E. Porter's Five-Force Industry Model

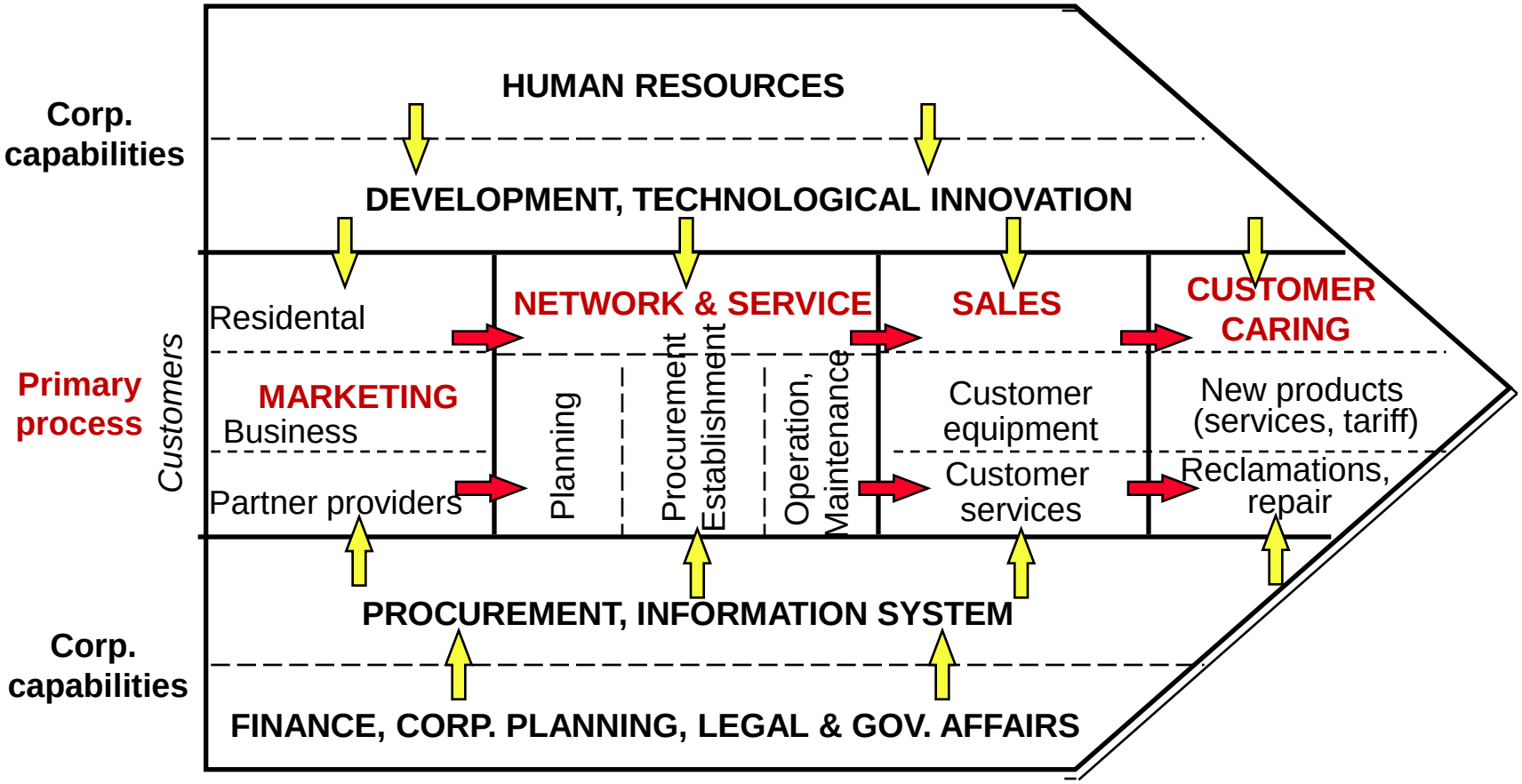


Availability of Substitutes: -differentiation, user's switching cost
-aggressiveness, etc.

ICT examples: high capital requirements, frequency permission, VoIP, basic service cancellation

Value-chain analysis

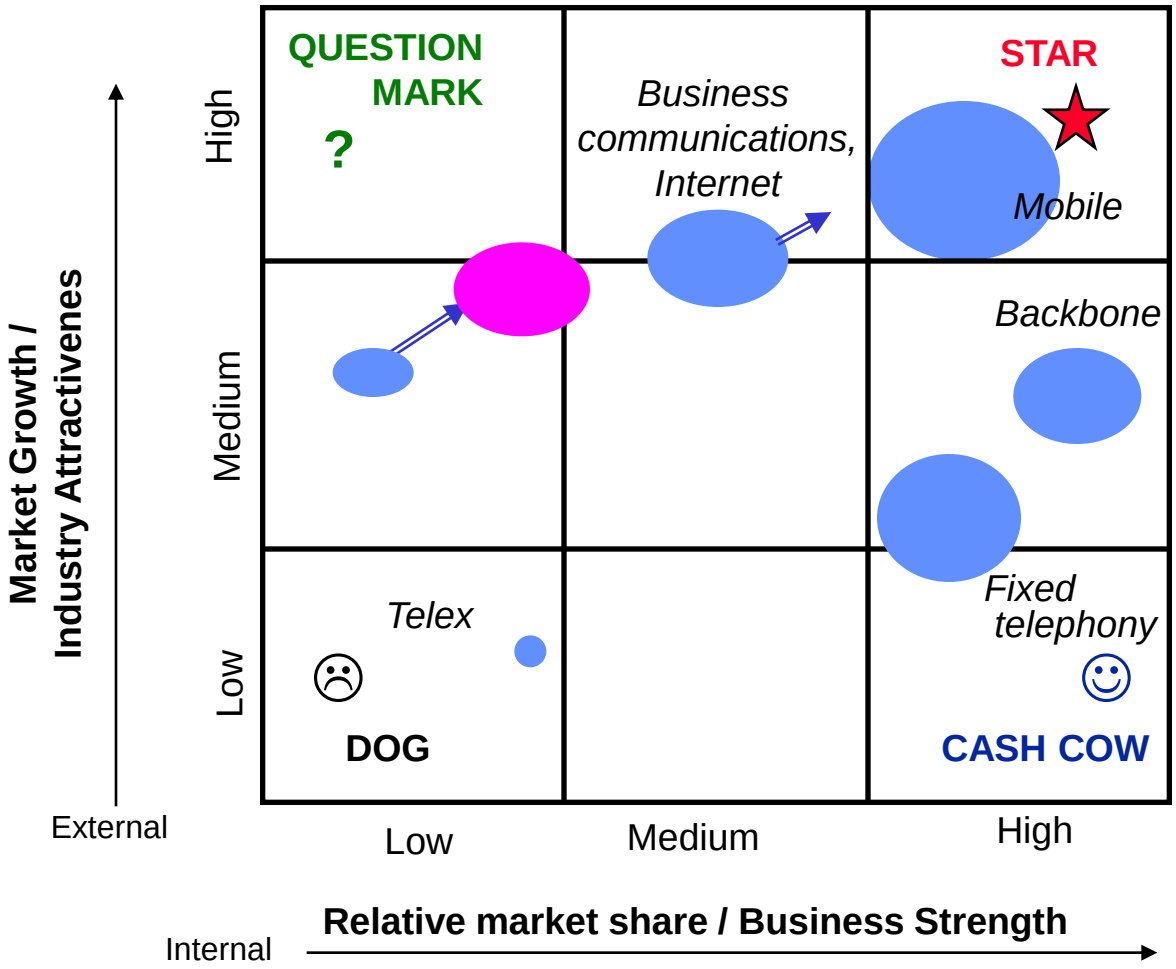
Decomposition and evaluation of the examined activities



It is analysed that what each activity component adds or can add
to maintain or obtain competitive advantage (increase income, decrease cost…)
Aim: identification of business competitive position (SW), critical tractable success factors

Portfolio matrices

The most popular: **BCG matrix** (Boston Consulting Group)



A BU, product or technology, etc. is presented by cicles. Present and future status, or the direction of change can be also sketched. Cycle size represents the business significance.

ERP II Vendors Are Deepening PLM Functionality Within Broad Enterprise Business Suites

Oracle

Strengths
- Strong brand recognition
- New software architecture
- Resources
- Global presence

Challenges
- Immature software
- Few reference customers
- Low engineering visibility
- Scarce PLM field resources

Threats
- Early PLM entrants capture the market before Oracle builds momentum

Opportunities
- Leverage current manufacturing customers
- Leverage software scope
- Leverage the wide use of Oracle

SAP

Strengths
- Strong brand recognition
- Business viability
- Discrete and process manufacturing base

Challenges
- Cost/time of implementation
- Resistance of engineering
- IPPe immaturity in production
- Software packaging

Threats
- Agile vendors grab business
- Miss the SMB market

Opportunities
- Leverage the large customer base
- Leverage the software scope

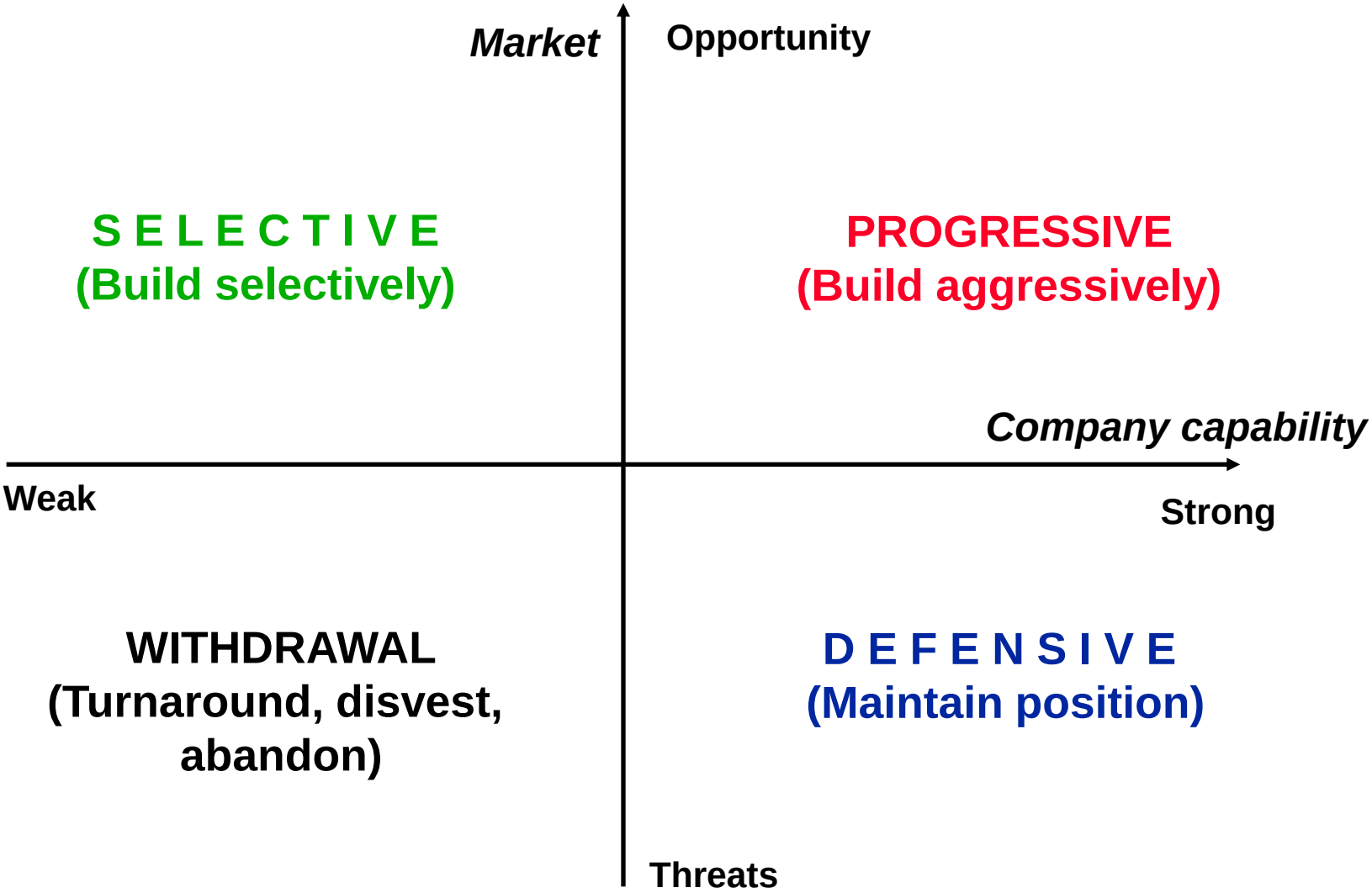
Challenges = Weakness

PLM Product Life Management
SMB Small-Medium Business

Gartner

CLASSIFICATION OF COMPETITIVE STRATEGIES

1. NATURAL COMPETITIVE STRATEGIES based on BCG matrix



STRATEGIC POSTURE

Declaration of strategic attitude

Based on SWOT, portfolio and other position analysis of the BU, product or technology:

- **Determination of natural strategies, competitive advantages**
  - Identification of strategic factors / key areas and strategic instruments / resources
  - Exploration of interrelations among the key areas, the instruments and products / technologies
- **Exploration of breakthrough opportunities, alignment of thrusts**
  - Risk analysis, consequence of delay or absence of the thrusts
  - Formulation of priorities, scenarios, alternatives
- **Arrangement of strategic focuses and instruments, formulation of programs and actions**

2. GENERIC BUSINESS STRATEGIES

Generic business strategy classes are based on two main dimensions:

a.) Scope is defined by

-the adressable market

-it can be limited by capital to invest

-starting or mature position

b.) Price or quality orientation can be determined according to

-expectation of the customer group

-product functions

-technological possibilities

	Price orientation	**Quality orientation**
Many customers	**Cost cutting**	**Differentiation**
Few customers	Focusing with cost advantage	Focusing with differentiation

2. GENERIC BUSINESS STRATEGIES OVERVIEW

Generic business strategies	Cost-minimizing	Differen-tiation	Focused differentiation	Focused cost-minimizer
Scope:	***wide***	***wide***	narrow	narrow
Differentiation:	low	***strong***	***strong***	low
Orientation:	Mass ***price competition***	Cust' groups ***variety***	Cust' demand ***quality***	Market gap ***innovation***
Investment:	homogeneous	differential	special	slight
Skill:	narrow	wide	deep	special
Sensitivity to volumen	high	medium	low	very high
Critical:	Low quality	Complexity	R&D sensitive	Market knowledge

STRATEGY IMPLEMENTATION

Key to change - management:

Harmony of strategy, processes, organization, resource-allocation and culture

The change is durable if it touches corporate culture and internal value system, too.

- ***Meeting demands of customers***
  (It is an opportunity for us...)
- ***Profitability***
  (Invest, only if...)
- ***Team work***
  (Integrate our knowledge, learn and change)

BSC – BALANCED SCORECARD

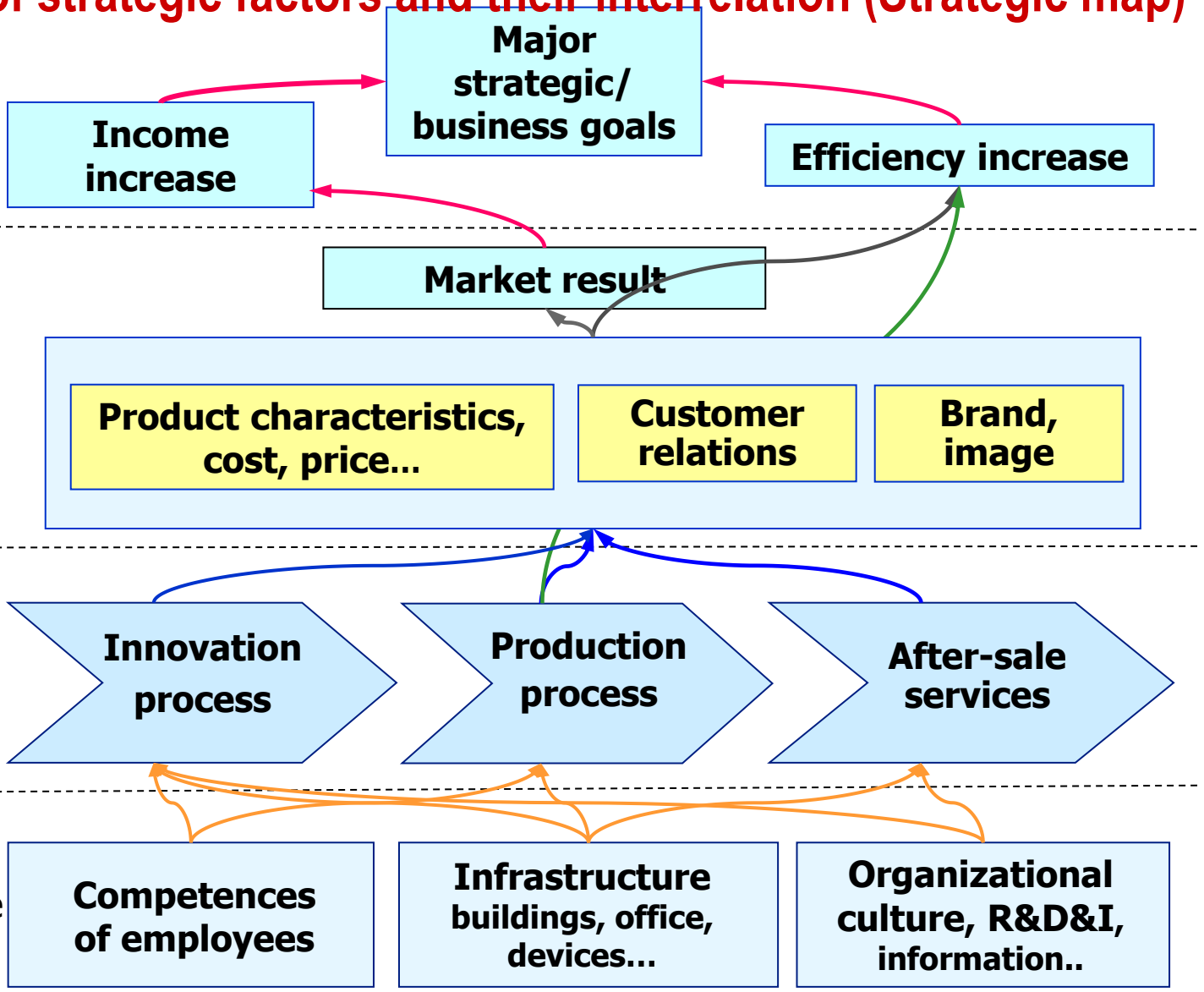
1. Explosition of strategic factors and their interrelation (Strategic map)

Stakeholders aspect (E)
How do stakeholders evalute the business position of the firm ?

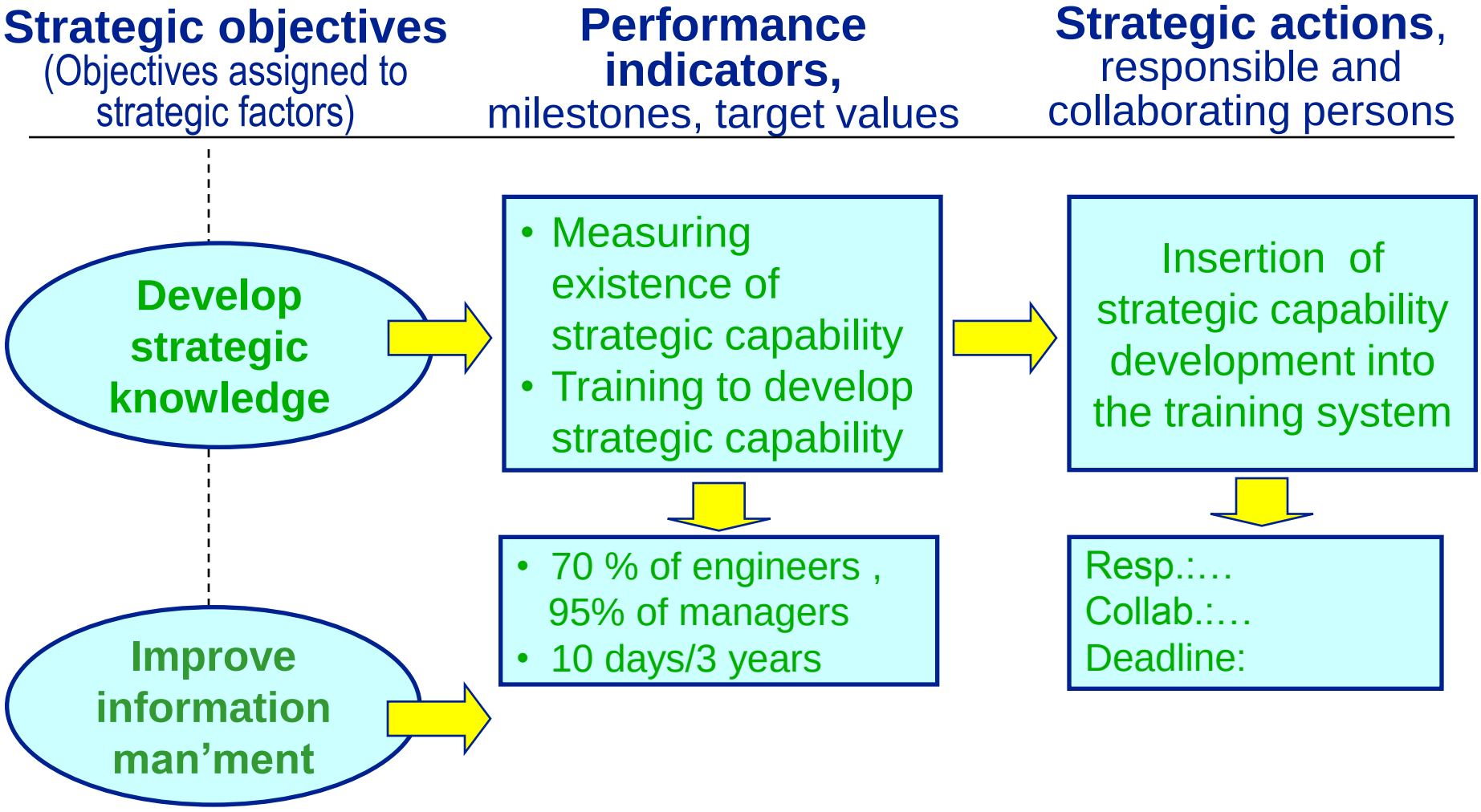
Customer aspect (P)
How do the customers evaluate the market performance of the firm?

Value-chain aspect (A)
How do internal processes and org. structure support the value creation ?

Development aspect (I)
How do they ensure preparedness to future goals?



2. Strategic objectives, indicators, actions related to strategic factors



3. Monitoring and controling of strategy execution

Measuring the progress and managing the deviation

SUMMARY OF STRATEGIC METHODS

CHARATERISTIC METHODS	*ITS FUNCTION*
1. Business segmentation Determination of Strategic BU-s	*Division of firm's activity*
2. SWOT analysis ➡ Internal: corporate screening • value-chain analysis • capability, market share ➡ External: competitive analysis (Porter) STEP/HEAT analysis	*Analysis and determination of strategic focuses by BU-s*
3. Portfolio analysis Portfolio matrix of business activity (e.g. BCG matrix)	*Integrate, determination of business strategies*
4. Balanced scorecard (BSC) Strategic factors, strategic map; balanced indicators; monitoring of implementation	*Execution of strategy, controlling*

Engineering Management BMEVITMMB03

BME Faculty of Electrical Engineering and Informatics MSc EE and IT Majors
Economic & human themes

SRATEGY MAPPING & BALANCED SCORECARD

How to put and inplement strategy

Zsuzsanna Kósa PhD
associate professor

BME Dept. of Telecommunications and Media Informatics
Budapest, 2018

Balanced strategic viewpoints of 4 main interested groups

Owners viewpoint = Financial results

- *Long term profit*
- *Liquidity for short run*

Customers viewpoint = contentness of the customers

- *Market share*
- *Stable customer group*

ORGANIZATION

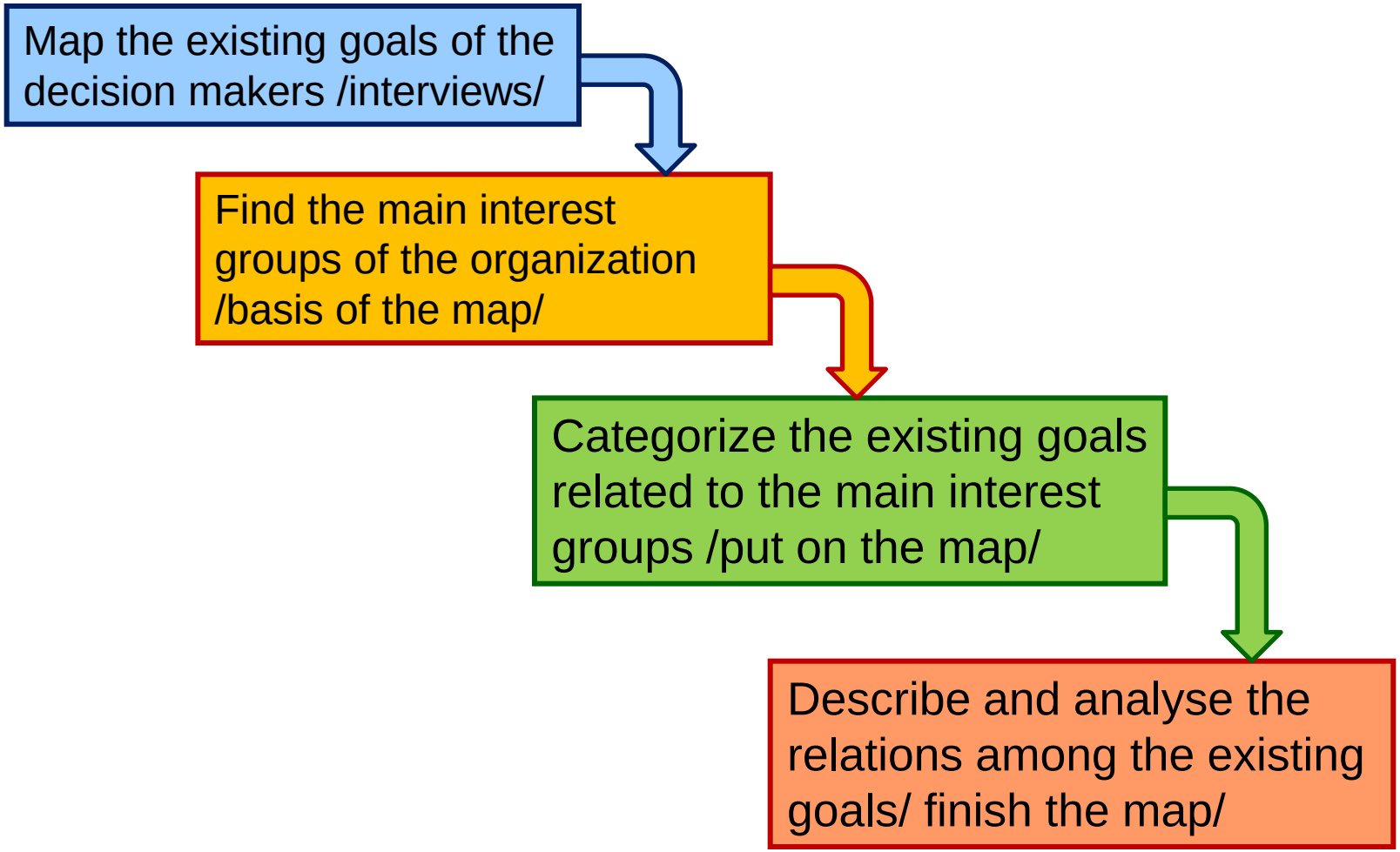
Managers viewpoint = well organized processes (costs)

- *Efficient productions*
- *Rational costs*

Employees' viewpoint = stable staff

- *Loyalty to the firm*
- *Valuable knowledge*

Strategy Mapping: identify goals

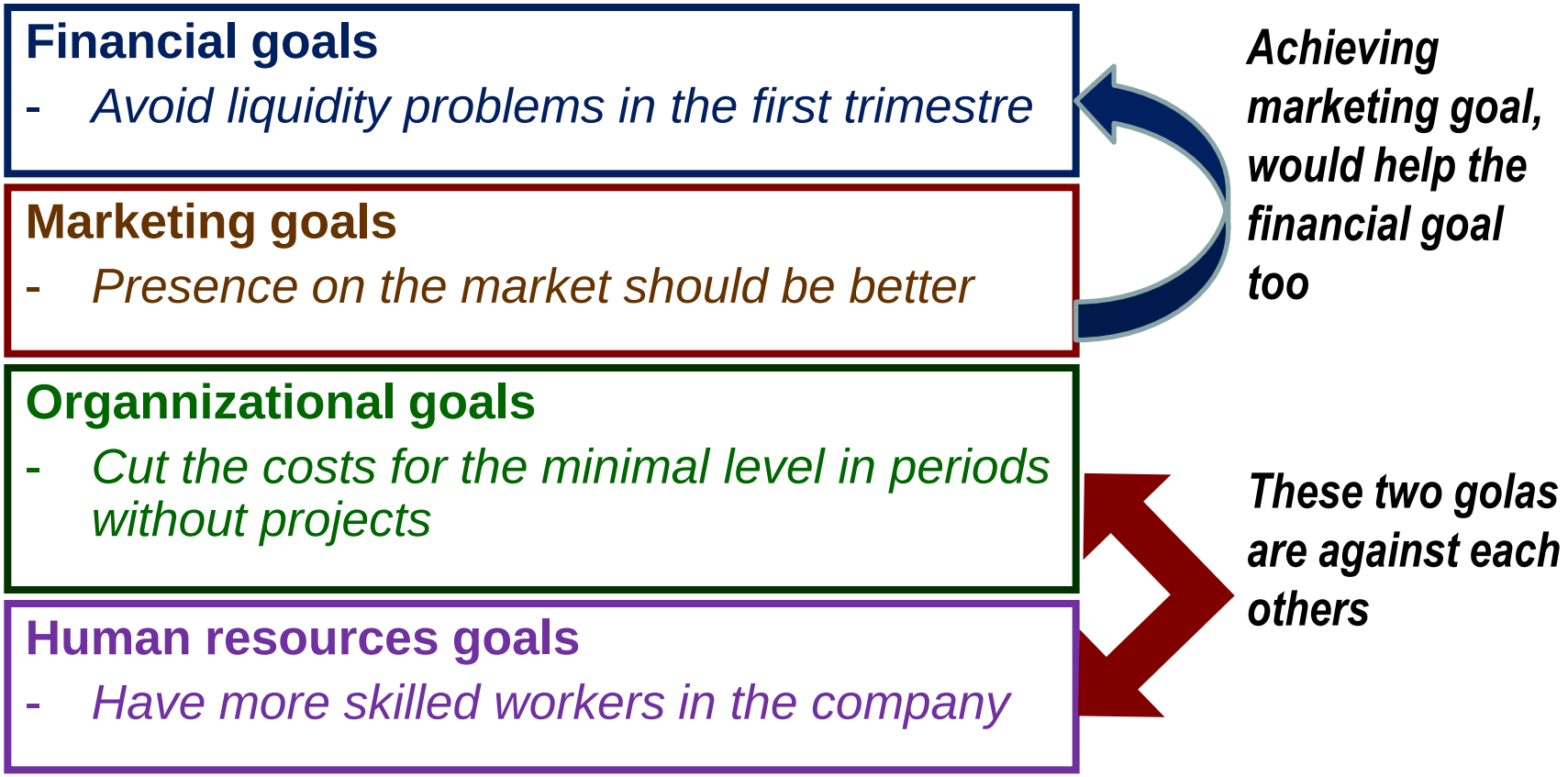


Strategic Map of goals

Goals should be in harmony with each others

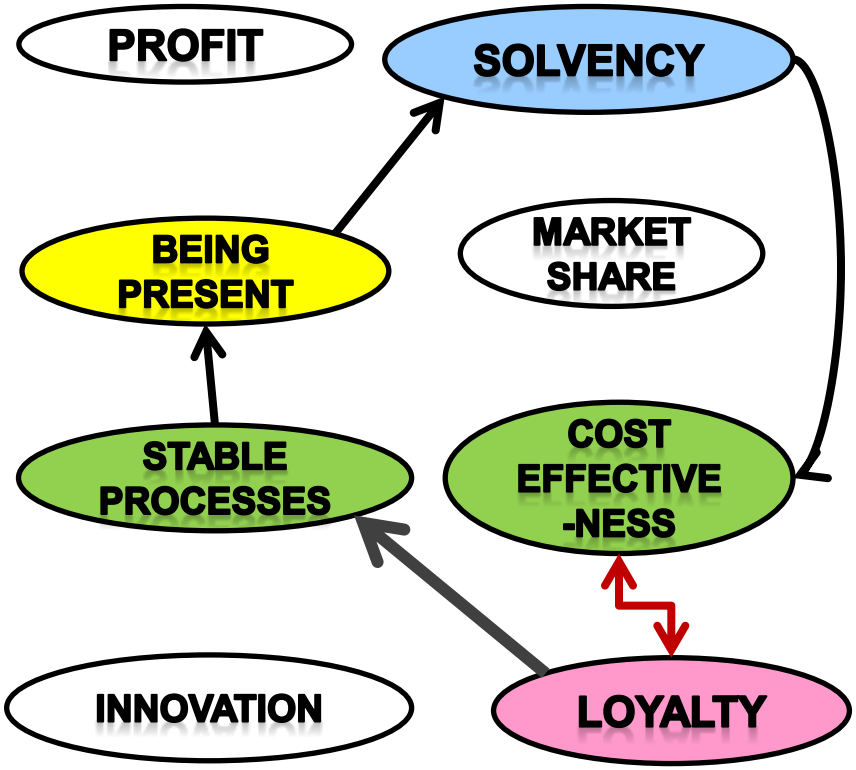
- *Each viewpoint need at least one goal*
- *Goals are not independent from each others*
- *If we go for one of the goals, the position related to other goals will be also changed.*

Example of relation among goals



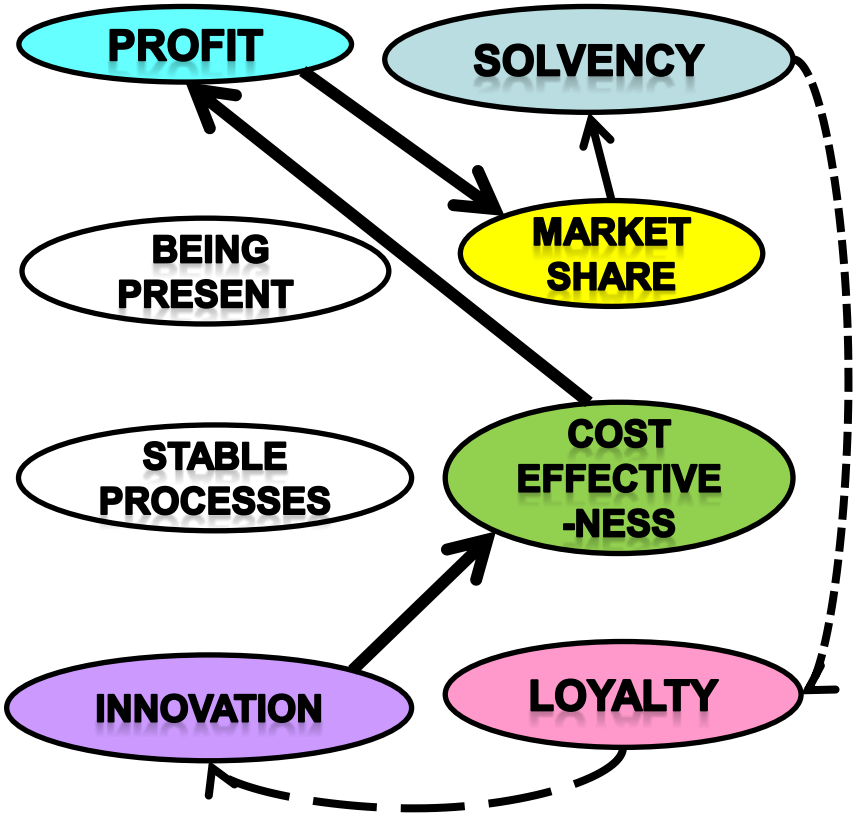
Negative Loops for stabilization on the map of strategic goals

- in a loop there are influences with different directions
- achieving one strategic goal, it would hinder to achieve other strategic goal
- There are many loops of goals with negative feedback, ensure stability to the organisation.
- These are the main factors of the ***Business as Usuall*** behavior of the organizations

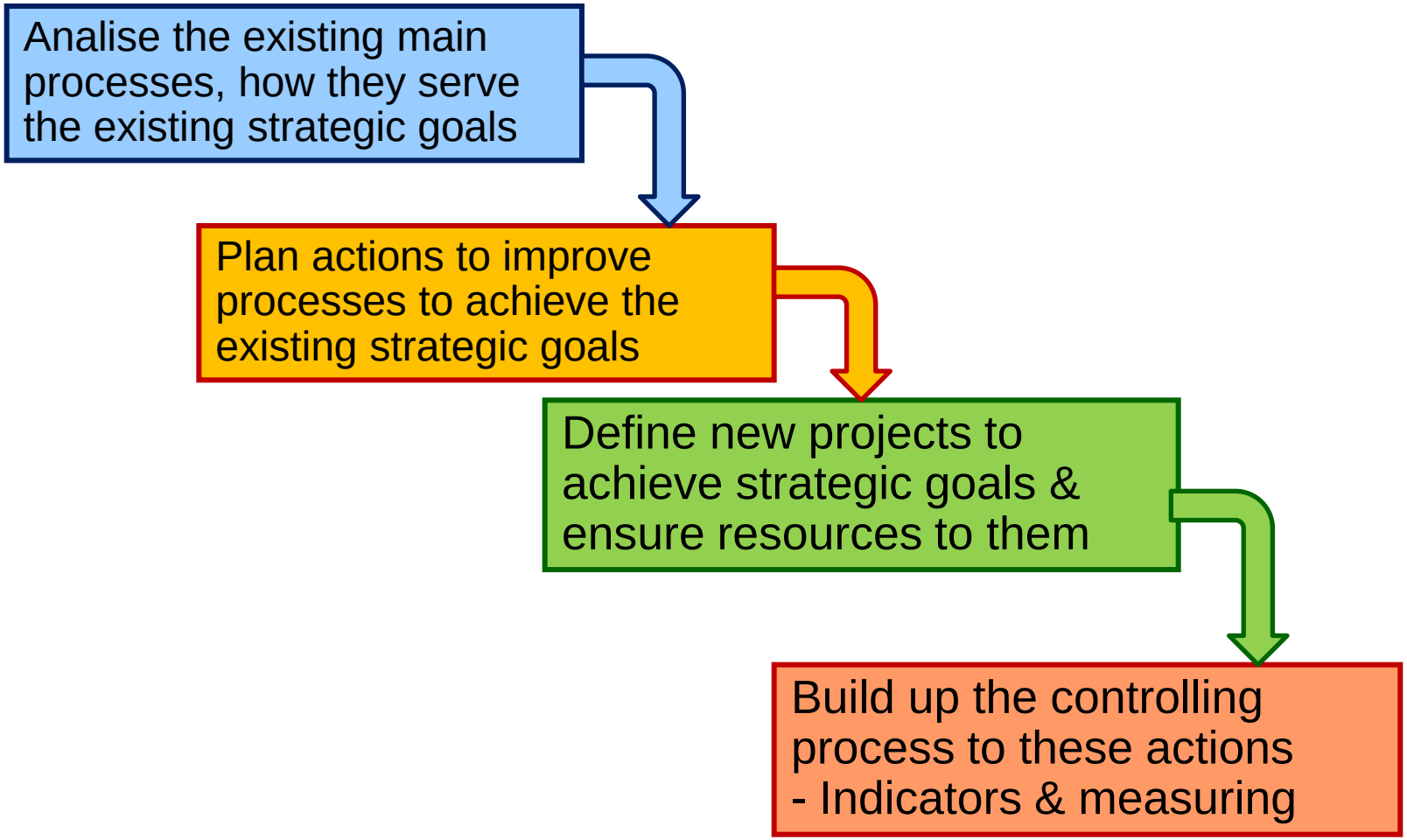


Positive Loops for intervention points on the map of strategic goals

- In a loop there are influences with the same directions
- achieving one strategic goal it would enhance to achieve another strategic goal
- There are few loops of goals with pozitive feedback, it may lead to instability of the organization.
- But, these are the **potential intervention points to the strategic actions!**



Plan actions based on strategy mapping



Action planning

Financial goals
- *Profit and liquidity*

Marketing goals
- *Stable presence on the market*

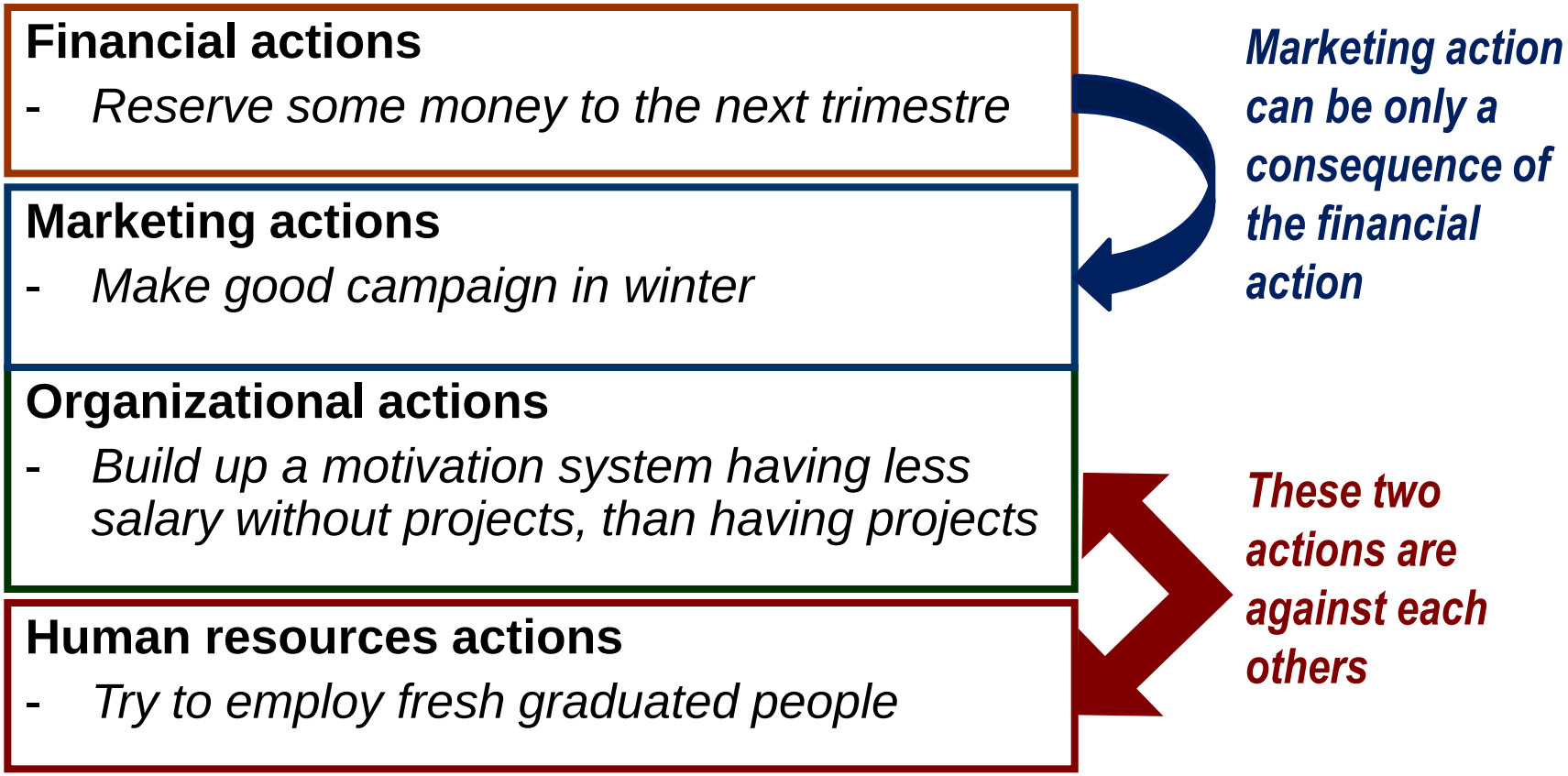
Organizational goals
- *Clear processes and costs*

Human resources goals
- *Ability for innovation*

Actions to achieve defined goals

- *Each goals would imply at least one action*
- *Each action would influence the other goals, enhancing or hindering it.*
- *Select those actions, which are to accelerate more than one goals*

Example of strategic actions' relations



How to define BSC indicators

Financial Indicators

- *Profit, free cash flow*

Marketing Indicators

- *Market share*

Organizational Indicators

- *Number of leaders/number of workers*

Human Indicators

- *Number of high level experts related to other employees*

Measurable indicators

- *Only clear and measurable indicators are good enough to be elected*
- *Measurements can not change the influence the indicator*
- *Measuring should be fast, easy and cheap*
- ***Each loop has to have at least one indicator***

Measuring Indicators

Financial Indicators

- *Profit, free cash flow*

Marketing Indicators

- *Market share*

Organizational Indicators

- *Number of leaders/number of workers*

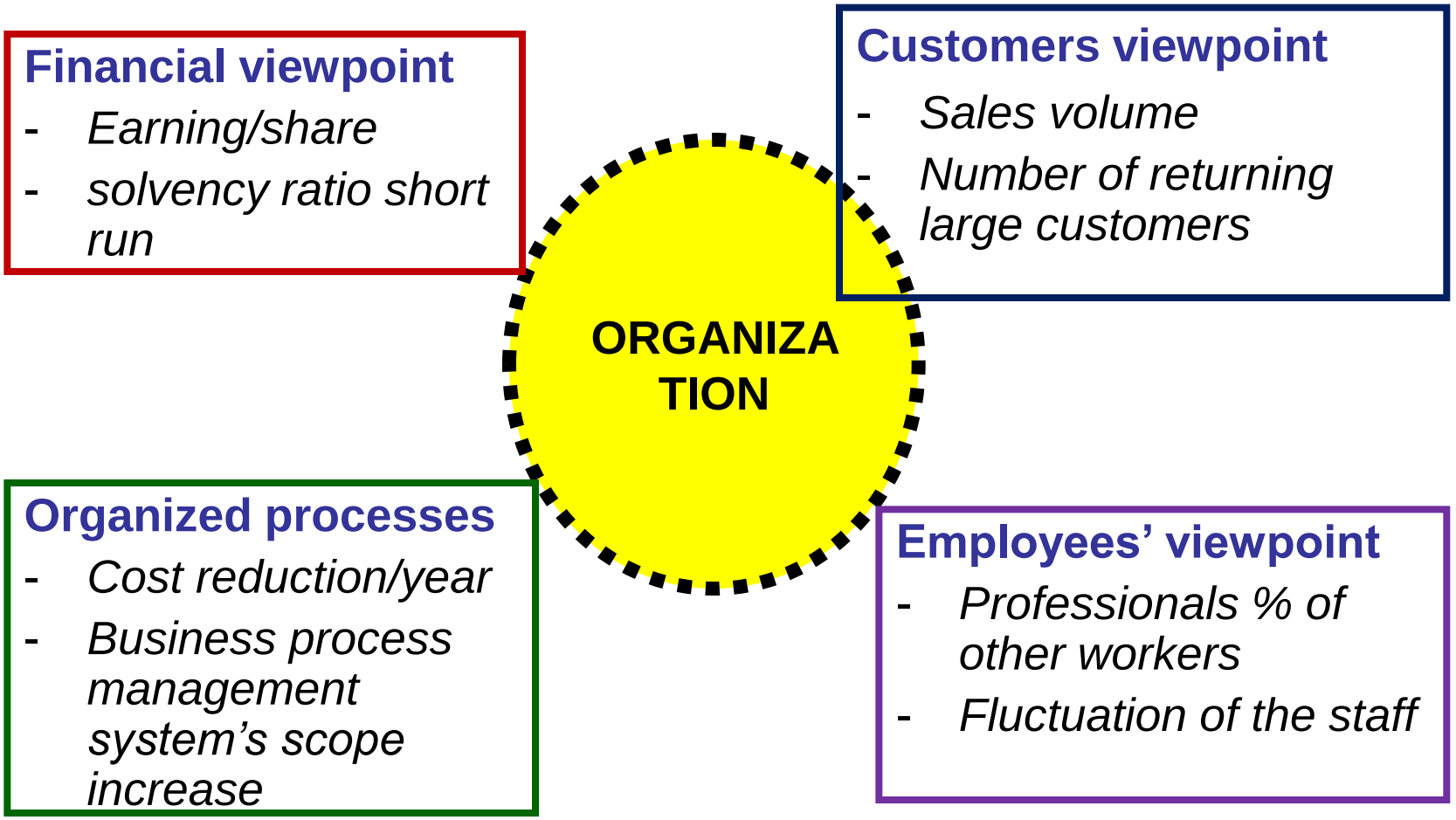
Human Indicators

- *Number of high level experts related to other employees*

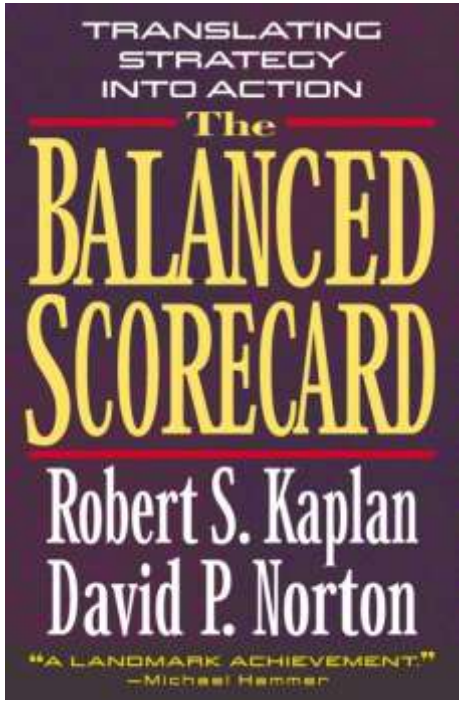
Analyse continuously

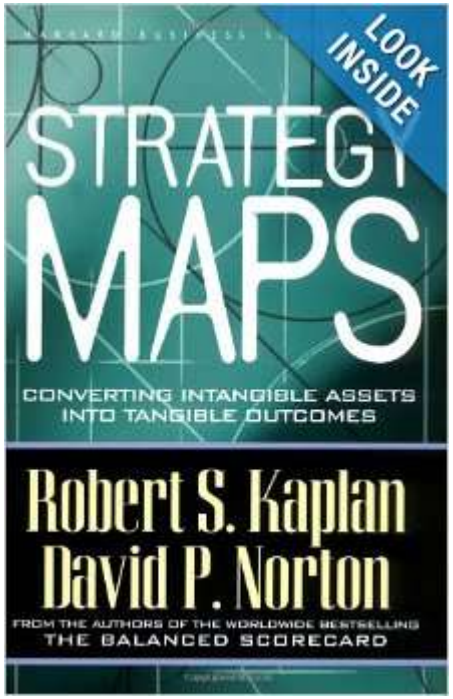
- *Indicators normally come **from the accounting system***
- *There is a normal band and expected value of each indicator*
- *In case the Indicator is out of its' band, some signal should be sent to the management*

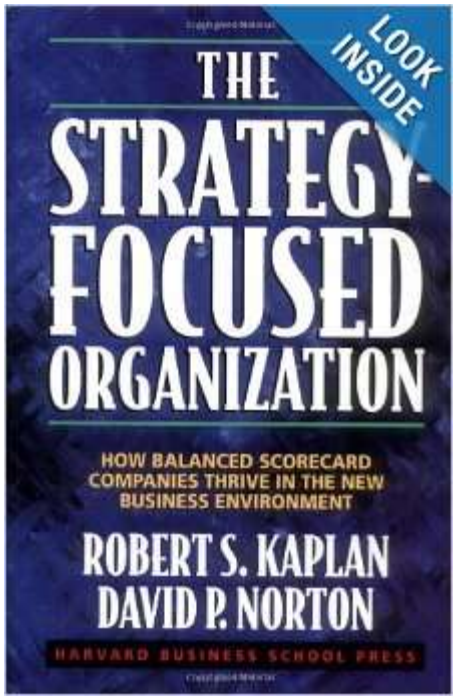
Balanced Scorecard Indicators



Books on Strategy Mapping and Balanced scorecard







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BME Fac. EE &IT MSc Majors
Economic & human themes

Technology Foresight

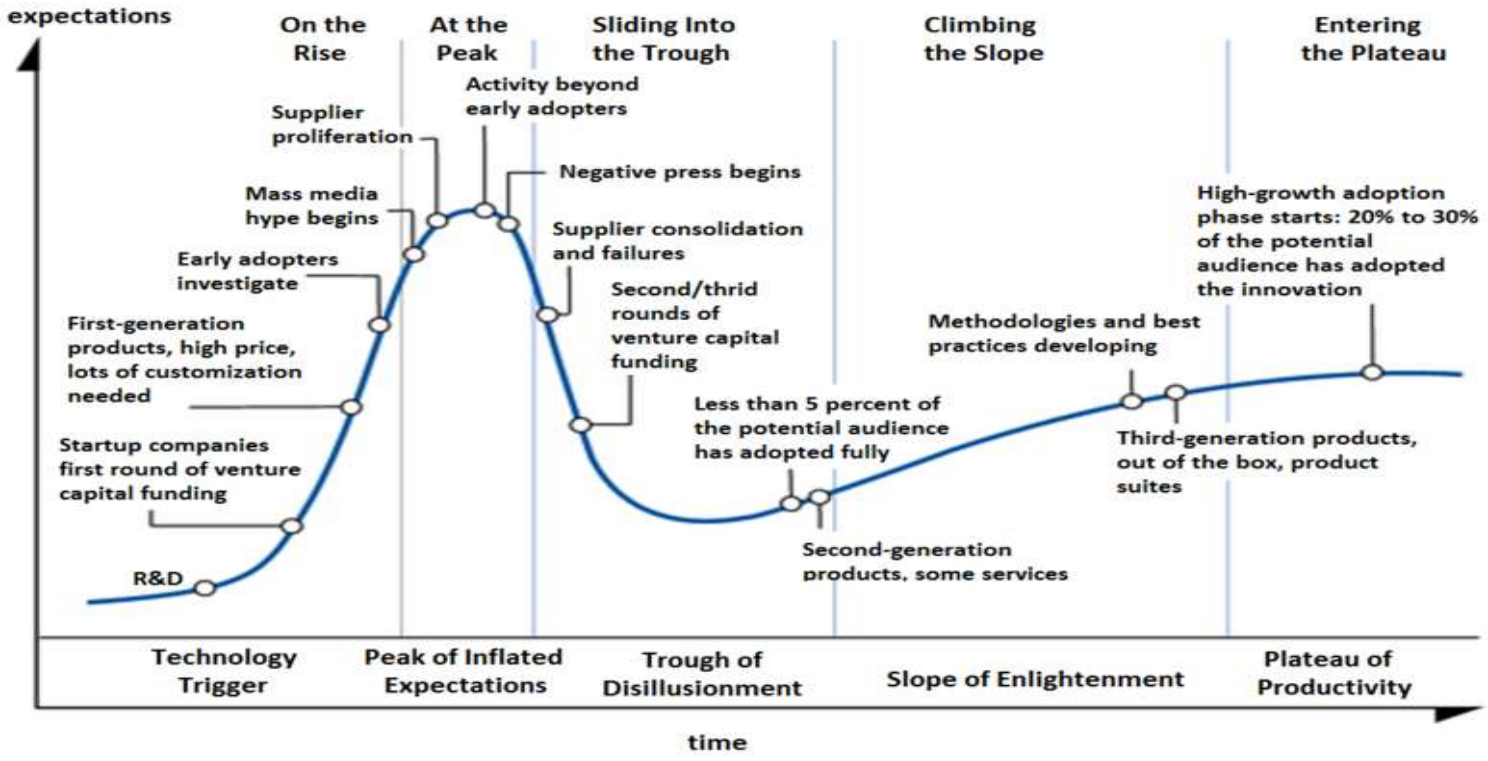
Zsuzsanna Kósa PhD

BME Dept. Telecommunications and Media Informatics

Budapest, 2018

Hype Cycle according to Gartner

How new technologies come into the market?



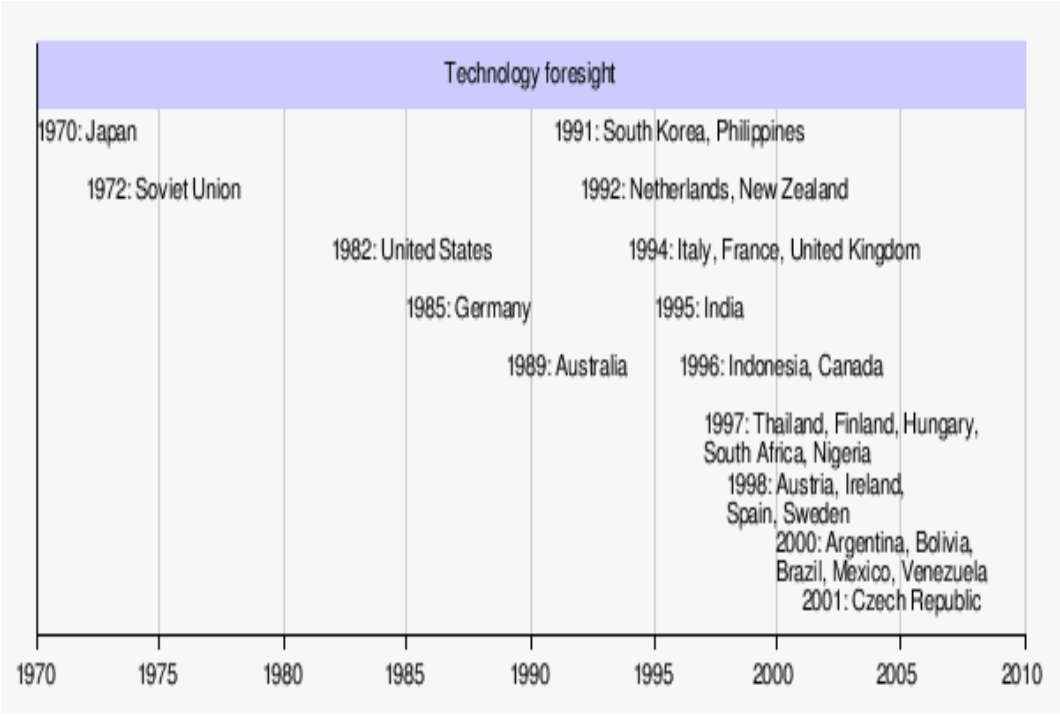
What is the best time to make the investment?

History of Technology Foresight

Methodology
Is spread by international organizations,
like UNIDO, OECD
IPTS

http://www.unido.org/foresight.html

Systematic foresight for10-30 years about technology changes was applied first in Japan



Forsighting Centres in the World

Institute for the Future in Palo Alto, CA, USA

- http://www.iftf.org/home/

Foresight in Latin America

Experiences in six Countries: Argentina, Brazil, Chile, Colombia , Peru , Venezuela *Presentation of YULI VILLARROEL*

- http://www.forschungsinfo.de/archiv/iFQ_Jahrestagung_08/beitraege/villarroel.pdf

Institute for Prospective Technological Studies (IPTS)

is part of European Commission's Joint Research Centre (JRC) in Seville, Spain

- http://ipts.jrc.ec.europa.eu/
- http://www.foresight-platform.eu/
- https://ec.europa.eu/jrc/en/research/foresight/ilv2025

Asia Pacific Economic Cooperation (APEC)

Center for Technolgy Foresight in Bankok, Thailand

- https://www.apec.org/Groups/Other-Groups/Specialised-APEC-Centers

Foresight in Hungary & Visegrad Region

Technology Foresight Program in Hungary 2002-2007

- http://nkfih.gov.hu/english/technology-foresight/hungarian-technology

Foresight as a key enabler of innovation in the economy

- https://link.springer.com/journal/40309/topicalCollection/AC_cf8ed737e9afefaa12fa7e69a0d12ad4

ICT prospective forecasting project in Hungary 2005-2010

- http://www.nhit-it3.hu/__ujsite2/images/tagandpublish/Files/it3-1000-1-1-3.pdf

Results are in a book in Hungarian

- http://bookline.hu/product/home.action?id=77077&type=22&_v=Domolki_Balint_szerk_Egen_foldon_informatika

Technology Foresight

What to prepare?

- Newsletter or Blog
- Focused technology analysis
- Vision of a usage area
- Trend analysis
- *Strategy suggestion (sometimes)*

How to do it?

- Collect information,
- Understand & compress it,
- Some intuition is needed

Why to do it?

- Research funding
- Basis for investment decision

Who will be the user?

- Decision makers
- Investors
- Experts

Further Introduction

- http://emergentbydesign.com/2010/06/15/essential-skills-for-21st-century-survival-part-4-foresight/

Methodology

- http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9310.2009.00579.x/pdf

Methodology for Technology Foresighting

Workflow:

- Scope of studies
- Collecting, understanding and compressing information,
- Starting study
- Consultation and questionare with experts *(Delphi method)*
- Iteration with the completed study

Products:

- ❑ Focused techology study („Deep drill”)
- ❑ Vision of a usage area
- ❑ Newsletter / Blog
- ❑ Technology radar
- ❑ Presentations for a professional community
- ❑ Communication with the experts and the professional community

On-line text analysis

Define the scope of the study for foresight

Collection of relevant information within the scope of technology

- News, research report, call for papers of a Conference or workshops
- Articles, books, publications
- Definitions, authors name, key words collection

Compressing the information:

- The scope of the topic
- Present situation
- Ongoing research, expected results

Think further the topic:

- Expected development
- Different scenarios in the future

Result: good questions for Delphi method

„Delphi” method

This is a method to catch the collective tacit-knowledge:

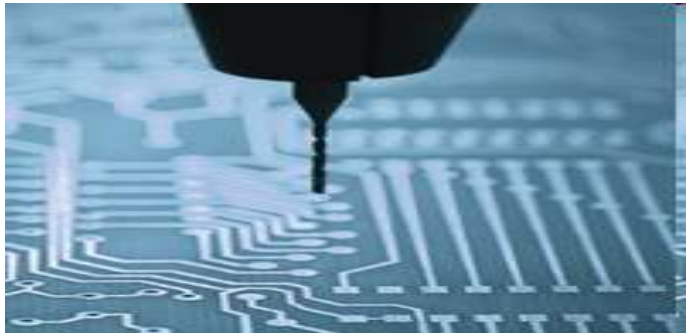
a. Define the scope of the study
b. Invite the experts of the topic, because each expert has a vision about his/her core business area
c. Ask them systematicly and collect their answers
d. Select the gained answers into two main groups: where the agree and where they disagree with each others
e. Topics, where thes agree will be the most probable future
f. Topics where they disagree, provide the different scenarios of the future
g. Repeat the method if it is needed

DELPHOI in Grece, the foresighting temple

Focused technology study

Template

- *Thesis: message into the first sentence*
- Scope
- Present situation
  - Parts of the scope
  - Stakeholders
  - Existing conflicts
- Ongoing research
- Most probable development of technology
- Prequisits and consequences to other technologies
- Domestical situation
- Summary



Vision of a usage area

Use Template:

- First sentence should be the main message
- Scope
- Present situation
- Influencing factors using
- PEST methodology
- Analysis of influencing factors:

- Relations to the examined area,
- Relations among the factos
- Strong and weak effects
- Uncertainties related to the vision of the influencing factors

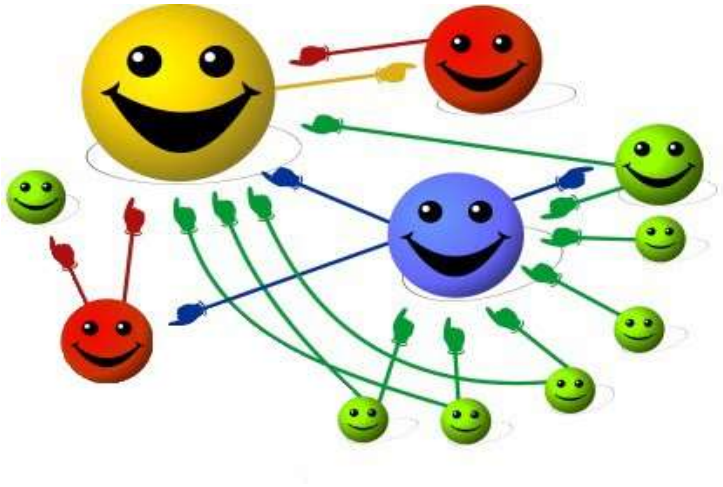
Visions made:

- Vision of Intelligent factors
- Vision of the workflow in offices
- Vision of intelligent transport systems
- Vision of information technology of learning

Professional communication with the experts

PEST method to analyse factors

- Influencing factors have direct or indirect connection to the examined area
- These factors have connections with each others



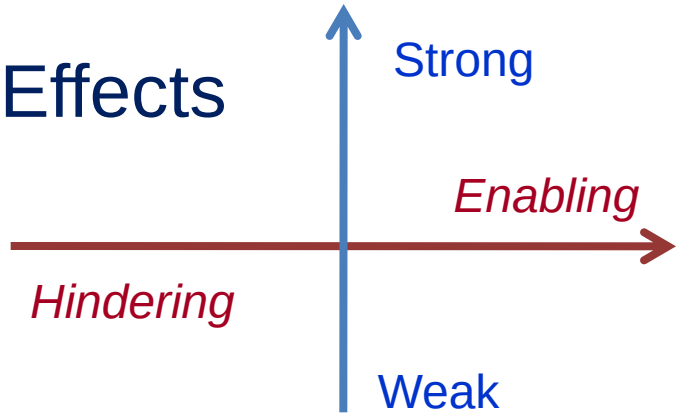
Group them into four groups:

P= Political factors

E= Economic factors

S= Social factors

T= Tecnology factors



Variations in vision: scenarios

Main vision

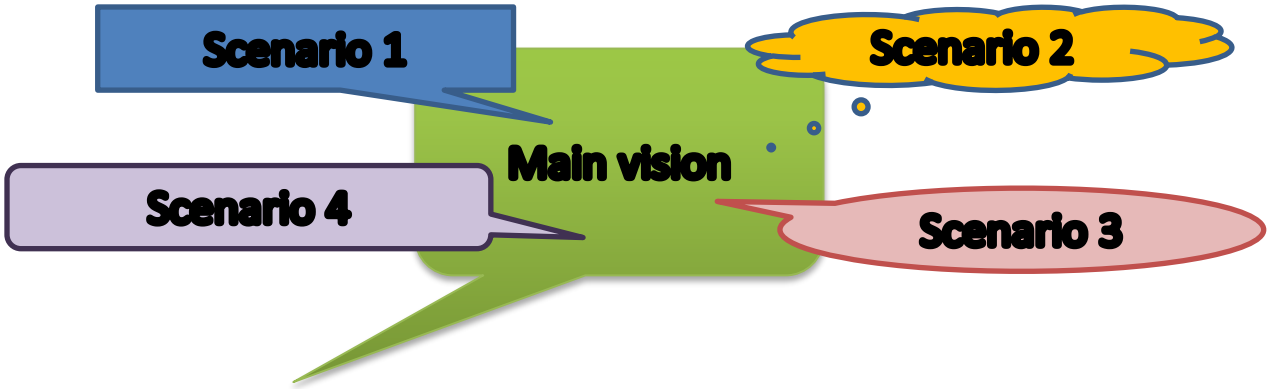
Effects of well defined and well determined,

strong influencing factors:

Descriptions may start with: „we expect, that…”

Scenarios

- Varations on the main vision
- Effects of well defined but uncertain strong factors
- Description starts with „If then”



Roadmaps, illustrations

Roadmaps show the route from present situation to the vision, including different scenatórios

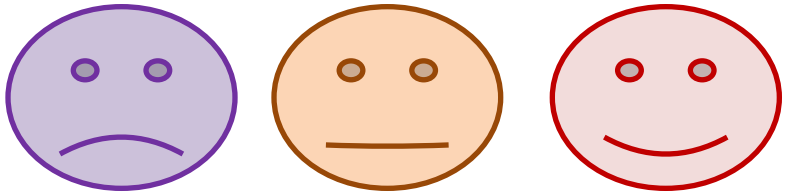
What should happen to achieve the future situation?

To acertain future situation there may be more than one roadmap

Illustration about a future situation:

- News for the future newspapers
- Description of a situation or a coonverstaion in the future
- Pictures or drawings

Reality examination



White Cards: remaining unexpected events

White Card:

- Unexpected events, disruptions
- First they show weak effects, but later there are more and more strong as a dominoes
- Later bring radical changes and may bring also crisis

Strategy making based on technology foresight

Select from the future scenarios:

- The best
- The most probable
- The most undesirable

Prepare the company to these scenarios now!!!

Study about scenario making:
http://www.die-gdi.de/CMS-Homepage/openwebcms3.nsf/%28ynDK_contentByKey%29/ANES-7LZJRH/$FILE/Studies%2039.2008.pdf

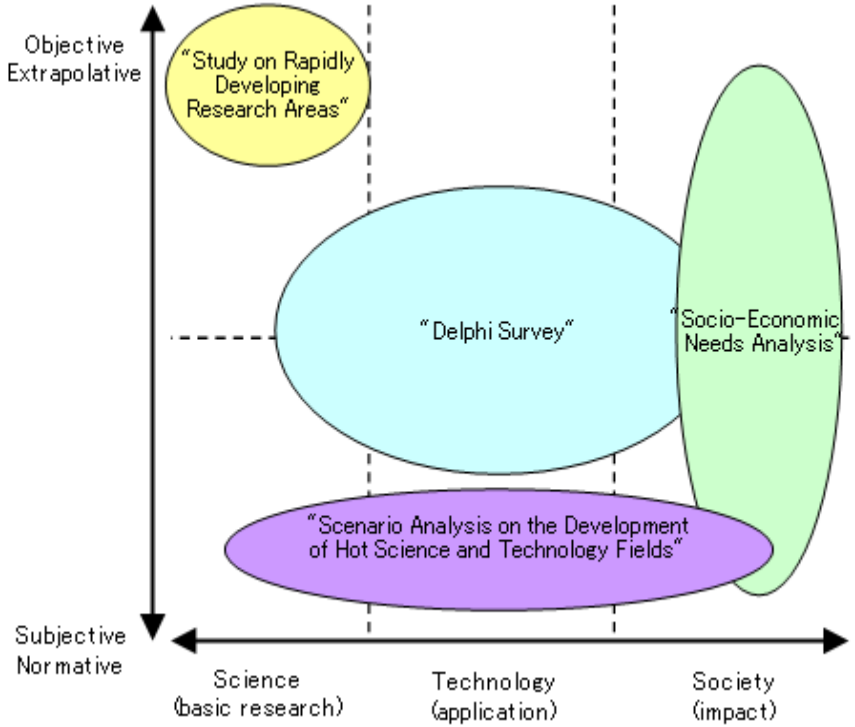
„Backward scenario building”

- Business strategy is based on long term visions
- The business goals for 5 years are based or influenced by the 10-30 year technology foresights

Summary

Technology foresight

- is made for decision makers or their experts,
- It makes long term analysis for 10-30 years,
- It can be made using all information available,
- Including the tacit knowledge of expert community,
- It can be a basis for bacward scenario making for strategy



Research on Science and Technology Foresight by Science and Technology Foresight Center
http://www.nistep.go.jp/nistep/about/thema/themaA-e.html

Engineering Management BMEVITMMB03

BME Faculty of Electrical Engineering and Informatics MSc EE and IT Majors

Economic & human themes

Complex decision problems

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Budapest, 2018

Fundamentals of decision theory

- Problem Owner, Decision-maker
- Decision task = problem
- Tools
- Decision logic

Simple decision tools

- **Decision table**
- **Decision tree**

Software tool groups for decision problems

MSS - Management Support System

- **ES - Expert System pl. MYCIN, DENDRAL**
- **DSS/GDSS - (Group) Decision Support System**
- **EIS - Executive Information System**
- **ESS - Executive Support System**
- **Others: e.g. Artificial Intelligence, simulation**

Decision logics

- **ALLOCATION** type :
  - in fix time
  - race condition
  - limited resource
  - OUTPUT: distribution
- **CREDIT** type:
  - unlimited time
  - unlimited piece
  - requirements
  - no race condition
  - OUTPUT: yes / no
- **SELECTION** type
  - in fix time
  - race condition
  - viewpoint/respect system
  - choosing 1 from more alternatives
  - OUTPUT: winner

Circumstances of decisions

- **Decision rules**: All rules of the circumstances

  E.g. public procurement procedure

- **Influencing factors**

Decision types

- Decisions under certainty
- Decisions with risk
- Decisions under uncertainty

Decision theory paradoxes

- **Allais paradox**
- **St. Petersburg paradox**

- **A: 1 M$**
- **B: 10% 5 M$**
  89% 1 M$
  1% 0

C: 11% 1 M$
89% 0

D: 10% 5 M$
90% 0

Decision theory paradoxes

- Allais paradox
- **St. Petersburg paradox**

Decision problems in many respects

Multi-criteria Decision Analysis (MCDA)

Multi-criteria Decision Making (MCDM)

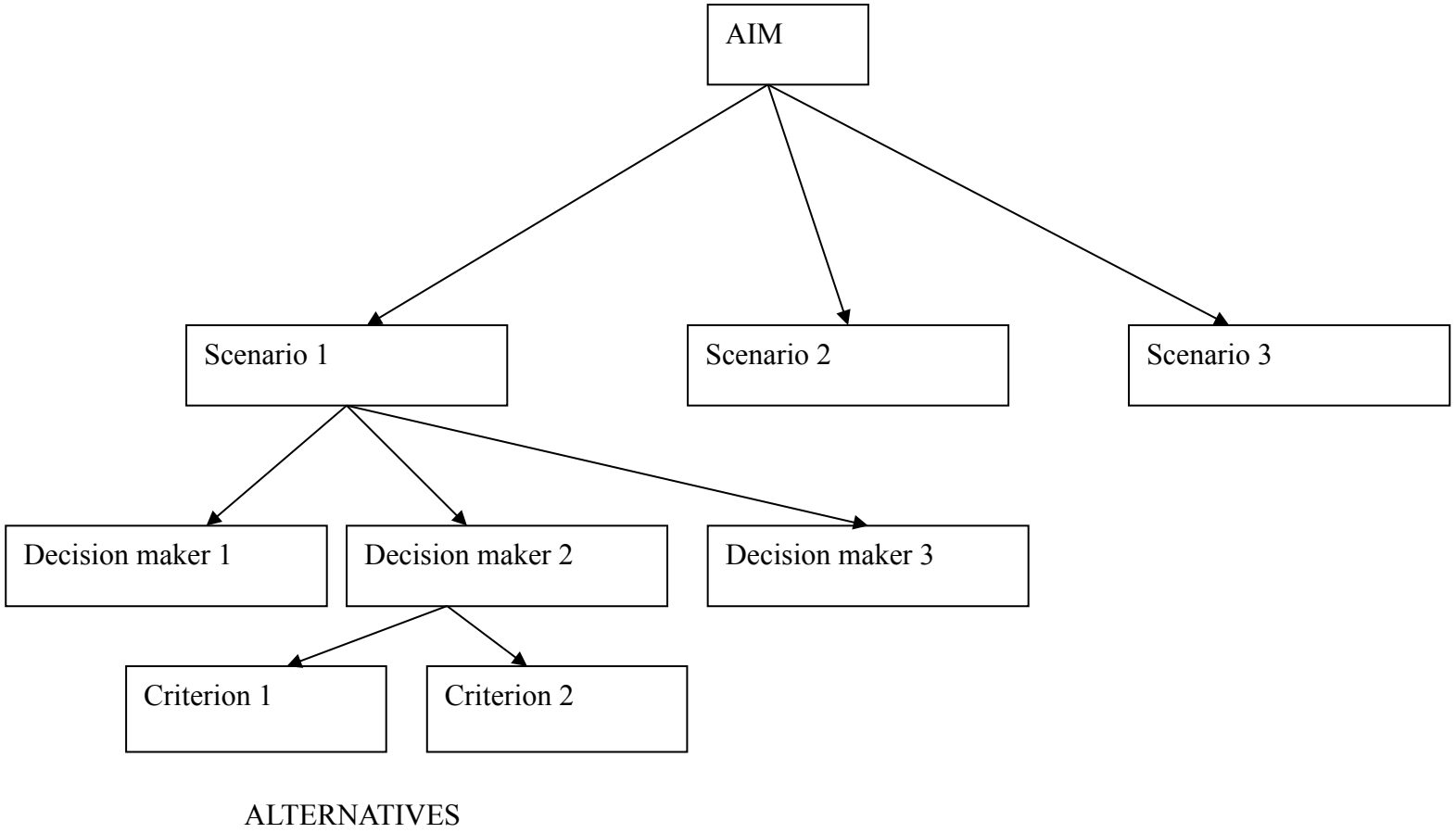
Multi-criteria Decision Models

- Analytic Hierarchy Process (AHP)
- Analytic Network Process (ANP)
- ELECTRE (Outranking)
- Multi-Attribute Utility Theory (MAUT)

AHP

- Method is based on decomposition and synthesis.
- **Pair-wise comparison**
- Quantitative and qualitative variables.
- E.g.: Expert Choice software.

Hierarchical structure of AHP method



AHP procedure

- Let us see $C_1,\ldots,C_m$ criteria in a level of the hierarchy
- The weights corresponding to criteria: $\omega_1, \ldots,\omega_m$

AHP procedure (2)

- Pair-wise comparison of criteria: how much times more important criteria C_i than criteria C_j
  - $r_{ij} = \omega_i / \omega_j$
- r_{ij} values: R matrix. In ideal case:
  - $R^*\omega = m^*\omega$
  - where $\omega = [\omega_1,\ldots,\omega_m]$

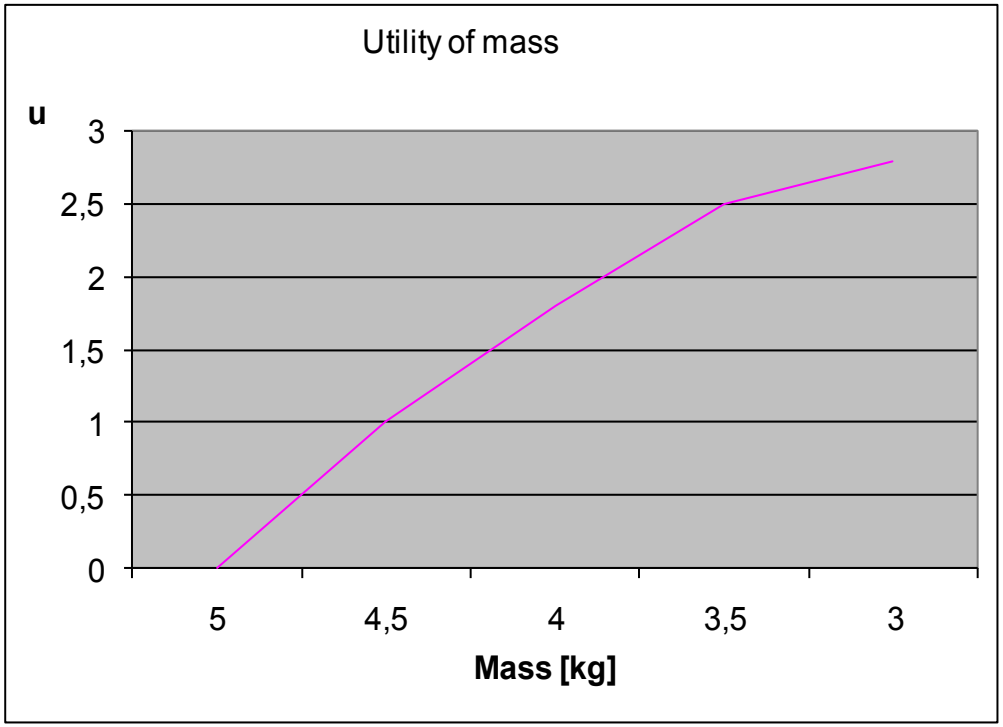
AHP procedure (3)

- Property of matrix R:
  - $r_{ji} = 1 / r_{ij}$

  and
  - $r_{ij} * r_{jk} = (\omega_i/\omega_j) * (\omega_j/\omega_k) = \omega_i/\omega_k = r_{ik}$
- In case of r_{ij} comparisons derived from decision makers: ω_i' are the estimated values of ω_i values.
  - $R' * \omega' = \lambda * \omega'$
- Solution of eigenvalue problem (linear algebra)
- Rank of R is 1, $r_{ii}=1$, consistency can be verified by the difference between *m* and maximal eigenvalue

MAUT (Multi-Attribute Utility Theory)

- Base on utility functions
- E.g:



MAUT

Decision procedure:

- Gathering the alternatives, declaration of viewpoints.
- Definition of utility functions.
- Determination of weights of each viewpoint.
- Valuation of all alternatives in each viewpoint.
- Summarization of weighted values.
- Analysis after the assessment, and proposal.

Group decision support methods

- Brain Storming
- Delphi methods
- Nominal Group Technique (NGT)
- Other Creative Problem Solving Processes
- Synectics
- Decision conference

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Economic & human themes

Game theory and its applications

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Budapest, 2018

Basics of game theory

- Players
- „Strategy”
- payoff
- Laws of game

Historical overview

- **John von Neumann:**
  minimax theorem
- **John Nash:**
  noncooperative game theory
- **John Harsányi:**
  complete information games
- **Lloyd S. Shapley:**
  cooperative theory

Parts of game theory

Noncooperative games

- Competition
- No communication

Examples:

- card games
- board games

Cooperative games

- Cooperation and competition
- Communication

Examples:

- team games

Simple dilemmas

- Prisoner's dilemma
- Tragedy of the Commons
- Iterated prisoners' dilemma (IPD)

Noncooperative game theory

- Perfect information vs. imperfect information
- Zero-sum vs. non-zero-sum
- two vs. more players

Noncooperative matrix games(1.)

$$\underline{\underline{A_1}} + \underline{\underline{A_2}} = \underline{\underline{0}} \quad \Rightarrow \quad \underline{\underline{A_2}} = -\underline{\underline{A_1}}$$

	1. st	2. st		n. st	
1. st	a_{11}	a_{12}	…	a_{1n}	$b_1 = \min \{a_{1j}\}$
2. st	a_{21}	a_{22}	…	a_{2n}	$b_2 = \min \{a_{2j}\}$
…					
m. st	a_{m1}	a_{m2}	…	a_{mn}	$b_m = \min \{a_{mj}\}$
					$\max \{b_i\} =$ $\max \{\min \{a_{ij}\}\}$

a_{ij} are the payoffs, where i denotes the strategy of first player, and j denotes the strategy of second player.

Noncooperative matrix games(2.)

$$\underline{\underline{A_1}} + \underline{\underline{A_2}} = \underline{\underline{0}} \quad \Rightarrow \quad \underline{\underline{A_2}} = -\underline{\underline{A_1}}$$

	1. st	2. st		n. st	
1. st	a_{11}	a_{12}	…	a_{1n}	
2. st	a_{21}	a_{22}	…	a_{2n}	
…					
m. st	a_{m1}	a_{m2}	…	a_{mn}	
	$c_1=\max\{a_{i1}\}$	$c_2=\max\{a_{i2}\}$		$c_n=\max\{a_{in}\}$	$\min\{c_j\} = \min\{\max\{a_{ij}\}\}$

a_{ij} are the payoffs, where i denotes the strategy of first player, and j denotes the strategy of second player.

Saddle point

Condition of existing saddle point:

$$\max_{i=1}^{m}\{\min_{j=1}^{n}\{a_{ij}\}\}=\min_{j=1}^{n}\{\max_{i=1}^{m}\{a_{ij}\}\}$$

Optimal strategy of 1. player and 2. player is denoted by i^0, and j^0, respectively. Payoff value is the value of the game : $v = a_{i^0 j^0}$, and (i^0, j^0, v) triple is the solution of the game.

Equivalence and Interchangeability

- **Equivalence**: If there are more saddle points – e.g. (i^0,j^0) and (i^1,j^1) –, then the payoff values of them are equal, i.e.: $a_{i^0 j^0} = a_{i^1 j^1}$
- **Interchangeability**: furthermore the (i^0, j^1) and (i^0, j^1) point are saddle points as well.

Fundamental Theorem of Game Theory

- **Pure – Mixed strategies**
- **Fundamental Theorem of Game Theory:**
  Every matrix game with mixed strategy has solution.

Noncooperative bimatrix game

- At non-zero-sum game the matrixes are independent and these can be different : **bimatrix game**.
- Average payoffs of two players at mixed strategy:

$$E_1 = p^T \cdot A \cdot q \qquad E_2 = p^T \cdot B \cdot q$$

where p and q are the probability vectors of the two players.

Nash equilibrium

A strategy pair (p^0, q^0) is Nash equilibrium if:

$$E_1(p^0, q^0) \geq E_1(p, q^0) \qquad \forall p$$

$$E_2(p^0, q^0) \geq E_2(p^0, q) \qquad \forall q$$

Solvability

A noncooperative bimatrix game is solvable (according to Nash equilibrium) if every equilibrium possesses attributes of equivalence and interchangeability.

The value of the game: $u^0 = E_1(p^0, q^0)$, $v^0 = E_2(p^0, q^0)$.

The solution of the game: (p^0, q^0, u^0, v^0).

Dominance

A strategy pair *A* (p^1, q^1) dominates strategy pair *B* (p^2, q^2) at a bimatrix game, if

$$E_1(p^1, q^1) \geq E_1(p^2, q^2)$$

$$E_2(p^1, q^1) \geq E_2(p^2, q^2)$$

Dominance-solvable game

The iterated elimination of dominated strategies is one common technique for solving games that involves iteratively removing dominated strategies.

Problem: What is the situation when the game has equilibrium and this is dominated by another point?

Cooperative game theory

- Set of players: N = {1, . . . , n}.
- The group of players $S \subseteq N$ is the coalition. Some special cases:
  - N is grand coalition,
  - $\varnothing$ is empty coalition.

Characteristic function

- **characteristic function : v(S)**

  consists the maximal payment for each S.
- In a game (N, v)

  the imputation $x = (x_1, \ldots, x_n)$ is
  - **feasible** for S coalition if $\sum_{i \in S} x_i \leq v(S)$
  - **acceptable** for S coalition if $\sum_{i \in S} x_i \geq v(S)$

Distribution, core

In a game (N, v) the **imputation** $x = (x_1, \ldots, x_n)$ is

- **efficient** if $\sum_{i \in N} x_i = v(N)$
- **individual rational** if $x_i \geq v(\{x_i\})$
- **coalitional rational** if this is an efficient and for every S

$$\sum_{i \in S} x_i \geq v(S)$$

Shapley value

At N players in a game v ϵ G^N the i^{th} player's Shapley value is

$$\varphi_i(v) = \sum_{S \subseteq N \setminus i} \frac{|S|!(|N \setminus S| - 1)!}{|N|!} \left(v(S \cup i) - v(S) \right)$$

Given any "ordering" of the players, where each order is equally likely, the **Shapley value** ϕ_i measures the expected marginal contribution of player *i* over all orders to the set of players who precede her.

Game theory with engineering applications

- Strategic analysis of transition IPv4 – IPv6
- Advertisement strategy of service-quality attributes
- Network neutrality
- Cooperation in self organizing networks
- Energy housekeeping of mobile devices
- Transportation systems
- Frequency auction

Strategic analysis of transition IPv4 – IPv6

- network entity can choose an architecture and facility of conversion
- IPv6 is an autonomous system
- strategies of autonomous systems to profit maximization
- incentive role of authorities

Advertisement strategy of service-quality attributes

- advertisement of service-quality attributes (maximal bandwidth, costs, delay, jitter, error rate, etc.).
- Which strategy would be the best for long-term profit maximization?

Network neutrality

- A service provider would like to
  - get money from content providers,
  - restrict the users' traffic.
- Aim: Internet should be open and neutral.

Cooperation in self organizing networks

- Spontaneous cooperation may be, but it is unlikely, thus stimulation is needed.
- The players are the devices representing the nodes of network.
- Strategy e.g. the parameters of retransmitting at case collision
- Aim is the maximization of inverse of transfer time per data unit.

Energy housekeeping of mobile devices

- The strategies of the mobile phones (as players) can be the transmitting strategies depending on radio connection.
- Lifetime of accumulator can be used for the payoff function.

Transportation systems

- Route scheduling problem of transportation firms
- profit depends on other firms and the competition rules

- E.g. public road traffic

Frequency auction

Based on number of biddings

- first-price sealed-bid auction
- dynamic (open) auction

Based on items

- Single-unit auctions
- Multiunit auctions

Engineering Management BMEVITMMB03

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Economic & human themes

Projectmanagement

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Budapest, spring of 2018

Definitions of project

- A project is a temporary endeavor with a *defined beginning and end* (usually time-constrained and often constrained by funding or products). /Harrison, 1993/
- A project can be defined as a temporary endeavor undertaken *to create a unique product or service*. /Stuckenbruck, 1993/

- *Project is a **unique process** consisting of a **set of coordinated and controlled activities** with **start and finish dates**, undertaken **to achieve an objective** conforming to specific requirements including **constraints of time, cost and resources**. /ISO 8402, 1994/*

A project

- For well-defined and documented *objectives (outputs)*;
- Has *influence on the resource portfolio* of the company;
- Utilizes (limited) *resources*;
- Causes *changes* in its environment;
- Not „daily routine” in the life of a company;
- *Unique* (probably never repeated);
- Has *given starting and ending dates*;
- Usually is *late* to start,
- Often needs *new methodology* and technology;
- Well documented procedure.

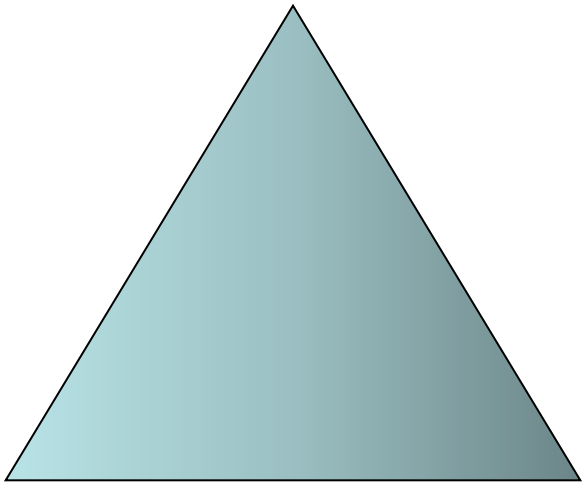
Resources of a project

A project is a set of activities utilizing **resources**:

- time,
- money,
- manpower (knowledge, experience),
- material,
- energy,
- place
- …

Project triangle

Scope (objectives, quality)



Time

Money

Items of project triangle

- **Scope:** requirements specified to achieve the final result (output). The overall definition of what the project is supposed to accomplish and a specific description of what the final result should be or accomplish.
  - **S.M.A.R.T.** model: the aim should be **s**pecific, **m**easurable, **a**ttainable, **r**elevant and **t**ime-bound.
  - there are some crucial **success criteria** among others.

- **Time:** required to produce the outputs (products or services). It is estimated using several techniques. One method is to identify tasks needed to produce the outputs documented in the **work breakdown structure** (**WBS,** see later).

- **Money:** to cover (buy) fixed and variable amount of other resources

From where do we have projects?

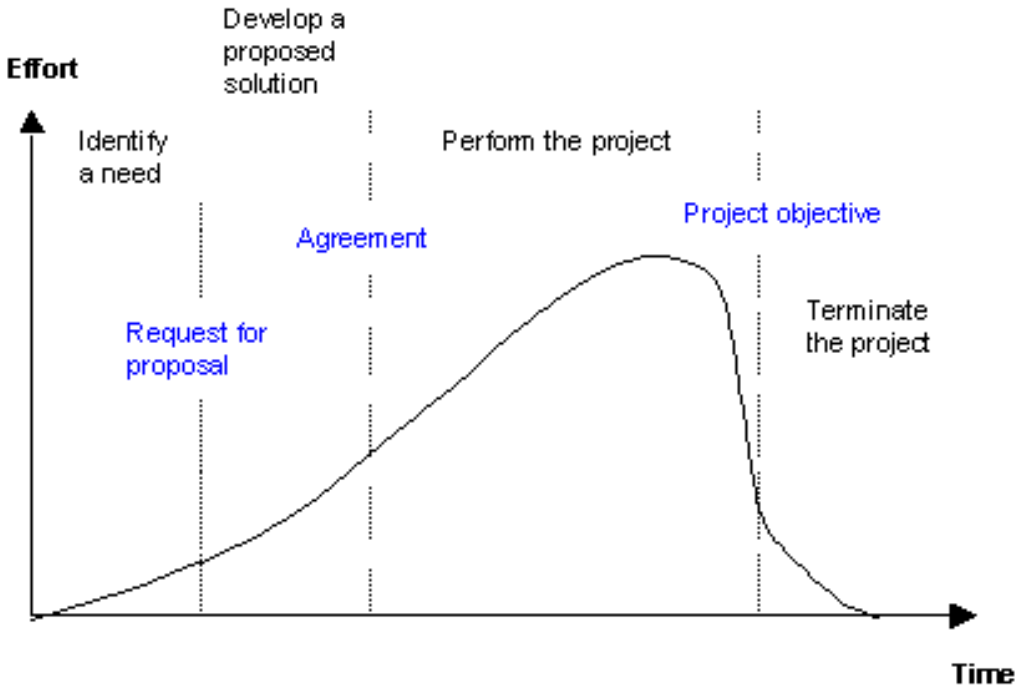
- Top - down: derived from strategy
- Bottom - up: development initiatives from the employees
- Out of the company:
  - from business partners,
  - obligation, charge laid by law, authority,
  - constraint by the environment.
- …

Project types

- PRODUCT DEVELOPMENT AND MANUFACTURING (if unique)
  - real estate development
  - machine manufacturing
  - service development
- ORGANIZATION, MANAGEMENT
  - functional planning
  - realignment
  - software installation
- RESEARCH, IMPLEMENTATION
  - fundamental research
  - applied research

Steps of projectmanagement

- Identify a need and/or purpose
- Develop the plan
- Perform and control the project
- Terminate the project



9 areas of projectmanagement 1/2

- **Integration management** harmonizes the different elements of the project.
- **Scope management** is to reach the aims of the project, furthermore to reengineer the project in case of changing the aims.
- **Schedule management** is to keep the original time schedule.
- **Cost management** is to keep the budget, furthermore to recognize the overspending and revise it.

9 areas of projectmanagement 2/2

- **Quality management** is to achieve the project results of expected and specified parameters (*quality*).
- **Human resource management** is to utilize, improve and train the human resource optimally.
- **Communication management** is to plan and run different communication channels to inform all the stakeholders involved in the project frequently enough.
- **Risk management** is to identify, analyse, minimize and prevent from risk, to work out risk contingency plan (once risks have been identified, what kind of countermeasures to execute).
- **Acquisition management** is to control the cooperation with partners and suppliers.

Approaches to manage projects

- **Traditional approach:** **five „classical" components** of a project can be distinguished (four stages plus control): initiation, planning, execution, completion and monitoring (control).
- **RUP method:** Rational Unified Process (RUP) is an **iterative** software development process framework created by the Rational Software Corporation, a division of IBM.
- **PERT:** the time parameters come from probability distribution (see later).
- **Critical chain project management (CCPM)** is a method of planning and managing project execution **considering the limited availability of resources** (physical, human skills, as well as management and support capacity) needed to execute the project. This is useful for **multi-project management** with resource leveling.

Multi-project management

- **Aggregation of projects, joint projects**
- **Planning (construction) and execution a group of projects together**
- **Managing independent projects of common resources simultaneously**

Determination of aim

1. Determination of problem definitely
2. Technical and functional goals definitely
3. Expected efficiency and economical results definitely
4. Requirements of final and quality parameters definitely
5. Resource demand and restrictions definitely
6. Assumptions; starting points optional
7. Risk factor optional

OUTPUT: feasibility study, document of project foundation

Planning a project

- **Determination of work breakdown structure (WBS)**
  - broken down into tasks
  - calculation the time requirements of tasks
  - determination the order of tasks
- **Time planning (schedule)**
  - calculation the time parameters of activities (start, finish, spare time)
  - estimation the shortest time possible to complete the project
- **Resource planning**
  - resource inventory
  - determination the resource necessities of activities
  - resource allocation (necessities and capacities, resource leveling)
- **Cost planning**
- **Quality and risk planning**
- **Communication and security planning**

OUTPUT: project plan

WBS: work breakdown structure

WBS is developed by starting with the final objective and **successively** subdividing it into manageable components in terms of **size**, **duration**, and **responsibility** (e.g., systems, subsystems, components, tasks, subtasks, and work packages) which include all steps necessary to achieve the objective.

Levels of WBS:

- project
- main tasks of the project
- tasks of the main tasks (subtasks)
- activities
- ...

Interdependence - relationships among activities

1. Spreading

- activities use same resource(s)
- an error occuring in one of the activities can influence other ones using common resource(s)

2. Sequential

- an activity **depends** on another one
- two types: **simple** and **overlapping**
  - **a)** **simple**: first activity should be finished to start the second one
  - **b)** **overlapping** : it is enough to execute only a part of the first activity to start the second one

3. Reciprocal

- Solution (execution) of a task is iterated among participants until the end of the project.

  e.g.: negotiation between the customer and supplier

Time planning techniques – Gantt-diagram

Advantage:

- schedule is in a clearly arranged form

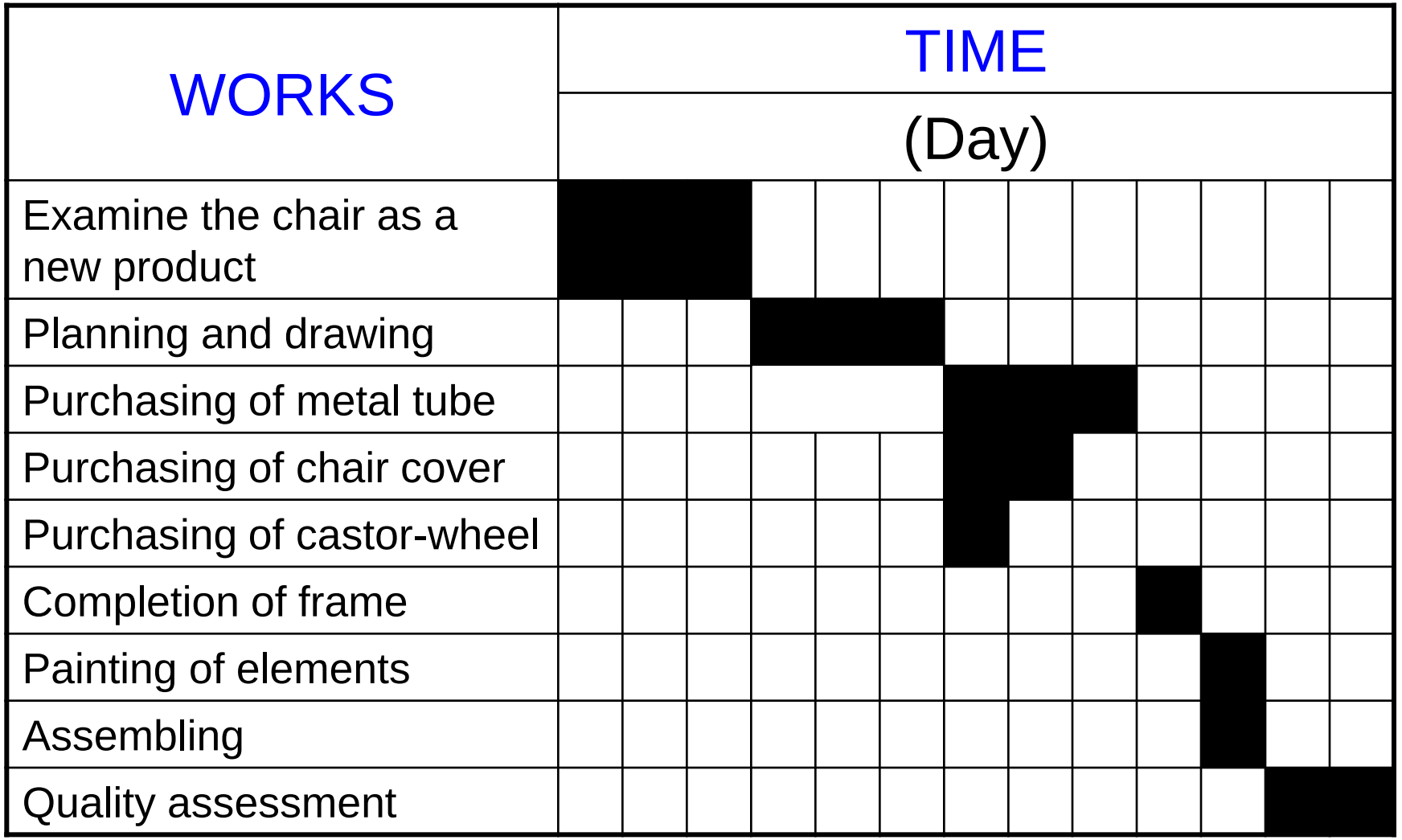
Disadvantages:

- in complex projects of too many activities can be chaotic (not transparent enough)
- relationships can not be clear

Elimination of disadvantages:

- introduction of slippage time
- plotting of dependence arrows

Gantt-diagram



Time planning techniques – Network planning

- Essential part is the network diagram in which the **tasks** and **their internal relationships** can be seen.

- Two classical methods:
  - **CPM** (Critical Path Method): the time parameters are fixed (deterministic method)
  - **PERT** (Program Evaluation and Review Technique): the time parameters come from probability distribution (stochastic method)

Steps of CPM 1/2

1. **Identification of tasks**

   (lists of tasks, subtasks and activities)
2. **Determination of predecessor/successor (logical) relationship among tasks**

   (identification of relationships and visualization)
3. **Determination of time parameters of activities**
   - early start time (ES)
   - early finish time (EF)
   - late start time (LS)
   - late finish time (LF)

Steps of CPM 2/2

4. Determination of critical path

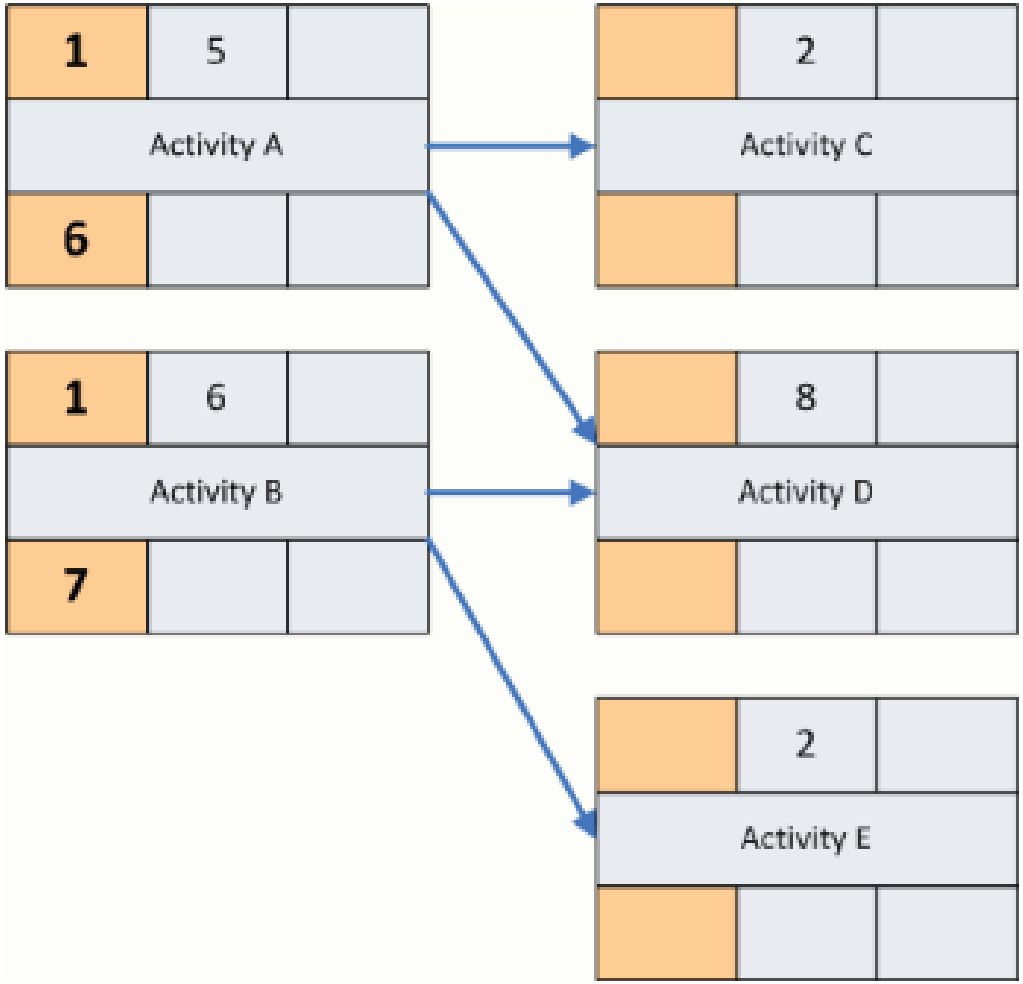
- **critical path:** the longest possible continuous pathway (consisting of critical activities) from the initial event to the terminal one. It determines the total calendar time required for the project.
- **critical activity:** an activity whose total floating time is zero.
- **total floating time (TFT) *(or slack)*:** the amount of time by which a project task can be delayed without causing a delay in any subsequent tasks (free floating time) or the whole project.
- **free floating time:** there is no critical delay

Determination of critical path

Steps:

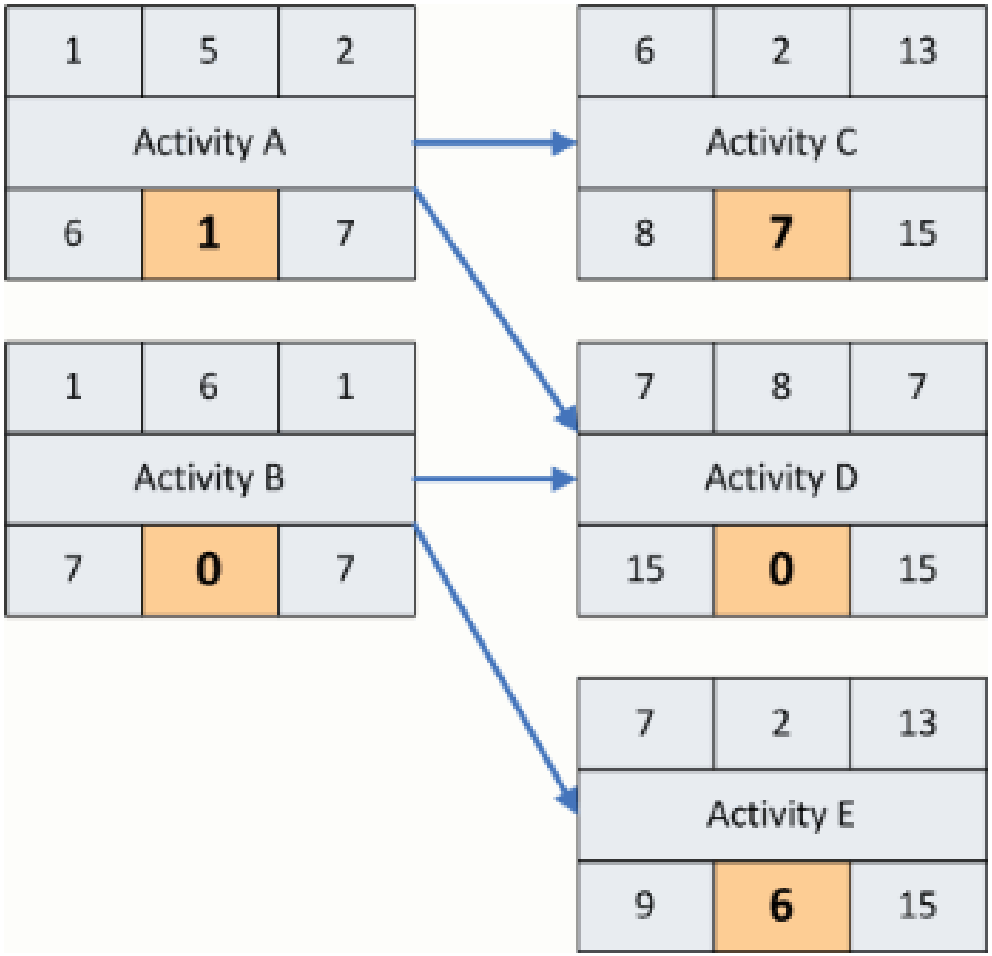
1. Determination of ES, EF, LS, LF values of activities
2. Calculation of total floating time of each activity TFT = LS – ES; TFT = LF – EF
3. Joining the critical activities we can get the critical path

Determination of critical path: EXAMPLE



Early Start	Duration	Late Start
Task Name		
Early Finish	**Total Float**	Late Finish

Determination of critical path: EXAMPLE (Solution)



Early Start	Duration	Late Start
Task Name		
Early Finish	**Total Float**	Late Finish

Shortening of critical path 1/2

- **More resources for critical activities:**
  - more own human resource (more people),
  - lease-work,
  - overtime,
  - more tools (eg.: IT) to replace human resource.

Shortening of critical path 2/2

- **Move resources** from non-critical activities to critical ones.
- **Change the project network** introducing:
  - parallel activities,
  - overlapping the activities on the critical path.
- Focus on **earliest** and **longest** activities.

PERT

- Similar to CPM
- If the duration of the activities cannot be determined because of random (uncertain) factors.
- Two requirements for the use:
  - **duration** of the activities should be *independent random variables*
  - **expected values** and **standard deviations** of *independent random variables* should be well estimated

PERT

Estimations:

1. **optimistic time** (t_o): the minimum possible time required to accomplish a task, assuming everything proceeds better than is normally expected
2. **most likely time** (t_m): the best estimate of the time required to accomplish a task, assuming everything proceeds normally.
3. **pessimistic time** (t_p): the maximum possible time required to accomplish a task, assuming everything goes wrong (but excluding major catastrophes).

Calculation:

$$t_e = \frac{t_o + 4t_m + t_p}{6} \quad \text{and} \quad \mathrm{v} = \left(\frac{t_p - t_o}{6} \right)^2$$

t_e = expected time; the best estimate of the time required to accomplish a task

v = variance of time

Cost management

Methods and tools to accomplish the project in the predetermined cost plan.

Elements:

1. Resource planning
2. Cost estimation
3. Budget calculation
4. Cost verification

Resource planning

- Determination of **resources** (human, tool, equipment, material) and their **quantity** and **quality** for the project.
- Required:
  - WBS – resource usage
  - A priori information – experience
  - Intent declaration – aim of the project
  - List of resources – real demand
  - Policy in organization – human resources and tools
  - When are the resources available?

Planning the load of resources

- The resource allocation is a distribution involving eg. **manpower**. In resource loading each employee is assigned to a task in a percentage of a project (x% of the whole).
- The **total load of resource** is the summary of resources in all parallel activities.

Steps of resource planning

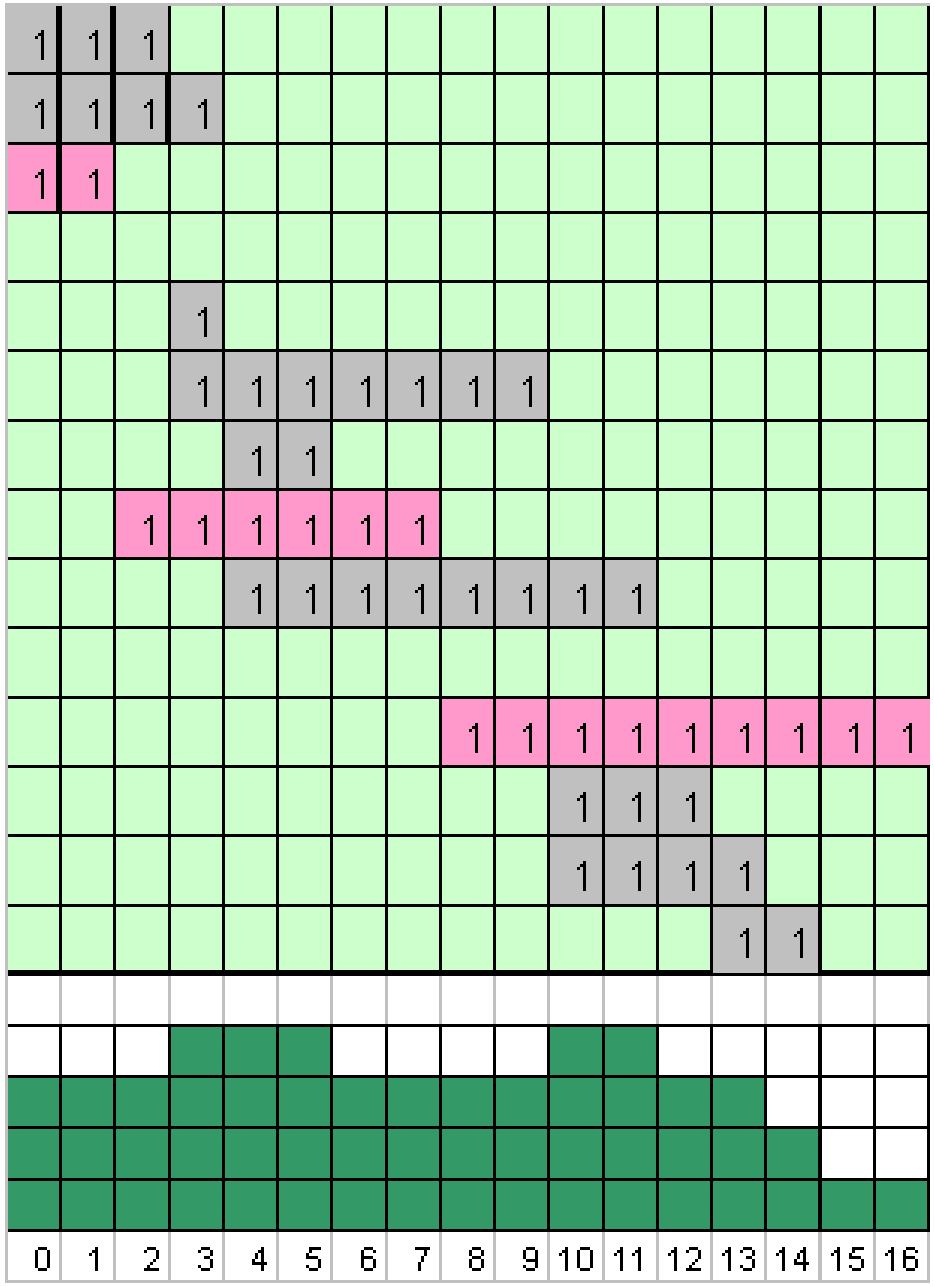
- **For each activity:**
  - gathering the resources into **resource inventory.**
  - determining the **resource needs** (norms)
- **For each resource:**
  - investigation of the **cumulative resource demands** as a function of time
  - use of **resource leveling** if required
    - exploitation of free float
    - modification of norms
    - more delay (modification of original time schedule)

Resource allocation

- How to manage the resources of the project?
- What is the resource need in function of time during the project?
- What should be done when the demand exceeds our capacities?
- „Time is money”. Why?
  - more salaries
  - indemnity (penalty)
  - worse deals
  - consequences of damages

Resource allocation

- Each activity starts at earliest time in the Gantt diagram.
- The dark green diagram shows the *cumulative demands* of the concerned resource as a function of time.



Project documents 1/3

Documents containing the tasks, expectations of the project:

- Feasibility study
- Document of foundation
- Requirements specification
- Changing management procedure
- Plan for risk management
- Communication plan
- Project plan
- Project terminating document
- Database of conclusions

Project documents 2/3

- **Feasibility study (business case)** describes the needs and solution alternatives to the problem.
- **Document of foundation** is the constitution of the project. It contains the framework, expectations, scope, deadlines and the project team.
- **Requirements specification** describes the aims in details.
- **Change management procedure** describes how to modify the original project plan if necessary.

  Escalation procedure: to invest additional resources in an apparently losing situation, influenced by effort, money and time already invested.

Project documents 3/3

- **Plan for risk management:** describes how to identify and evaluate different types of risk, assign responsible persons and cover areas of activities.
- **Communication plan:** communication strategy among the stakeholders. Notification to whom, about what, how often, through which channel?
- **Project plan:** contains the tasks, deadlines, responsibilities. The resource plan can also be outlined in this document.
- **Project terminating document:** summary, conclusion of the project, open to all stakeholders.
- **Database of conclusions:** here the project manager enters the conclusions, methods, solutions learnt during the project on record (for internal use only).

Expected software functionalities to support projectmanagement

- **All calculation** from the basic data
- Flexible **activity modeling**
- **Results** visualized **in several aspects**
- Software **recalculates** output online after any modification
- **Calendar, work schedule** for resources
- Automatic or manual **resource leveling**
- **Comparison** between plan and reality (for controlling purpose)
- Relationship to **other projects** (for multiproject management purpose)

Developing the project plan

- Definition of the project
- Planning the project activities
- Planning the resources
- Planning the costs
- Planning the quality and risks
- Planning the communication
- Optimization of the project plan
- Distribution the project plan among the stakeholders

Steps of the planning phase

1. Work Breakdown Structure (**WBS**).
2. **Precedence Diagram** (network plan with logical relationships).
3. Estimation of **resource needs and times**.
4. **Critical path analysis** and determination of total float.
5. Schedule in calendar or **Gantt diagram**.
6. **Resource loading diagrams.**
7. **Budget.**

Estimation of execution time and work expenditures

Inaccuracy because of:

- Inaccessible data and resources;
- Training programs or holidays can occur in the project;
- Effectiveness is not the same of different colleagues;
- Different abilities and learning time;
- Private problems and motivations;
- ...

Planning budget 1/2

- ***Starting with fix cost: TOP-DOWN***

The budget is

- **fixed** or
- it is the **largest restriction factor** and the subtasks are not clear.

Planning budget 2/2

- ***Starting with activities: BOTTOM-UP***

  The cumulated budget will be the sum of the costs of subtasks. This type of planning can be used if there is no limit for budget, the aim is clear and the team can break it down into subtasks.

Project cost elements

- ***Resource dependent costs***
  - *Norm(al) costs*
  - *Overtime costs*
- ***Stress costs****:* constant costs independent of activities, eg.: rent.
- ***Activity dependent costs:*** correspond to work packages.

Risk analysis

Assessment of

- probabilities of problems (dangers) and
- effects of problems to the project.

Assessment starts with problem identification and classification.

Action plan:

- how to prevent risks,
- what to do if something wrong happens (BRP, BCP)

Scopes of project controlling

- Scope of the project
- (Time) Schedule
- Resource usage
- Costs
- Risks

Steps of project controlling

- **Monitoring**: collecting information from actual project status.
- **Comparison** of actual state with the original plan.
- **Difference analysis**: the aim is to reveal, explore the effects and causes of the difference.
- **Determination of interventions**: the aim is to decrease the difference.
- **Revision of plan**: the original plan should be revised if necessary.

Closing project

- Looking at the final project data.
- The project team should **verify** whether terminating criteria and indicators of success factors are achieved.
- The **aim** of projectmanagement is to develop and improve the enterprise or organization via serving **satisfied clients**.

Engineering Management BMEVITMMB03
BME Faculty of EE &IT MSc Majors
Economic & human themes

Cross-cultural Communications

Zsuzsanna Kósa PhD

BME Dept. Telecommunications and Media Informatics
Budapest, spring of 2018

Overview

1. Culture seems to be an iceberg
2. Different ways of thinking and saying
3. Levis Model of cultural diversity
4. Definition of Culture by Hofstede (onion)
5. Dimensions of National Business Cultures
6. Inglehart–Welzel Cultural Map
7. Cross cultural communications
8. Unacceptable approaches
9. Verbal communication
10. Eating & drinking together
11. Meta-communications
12. Summary
13. Books on the topic

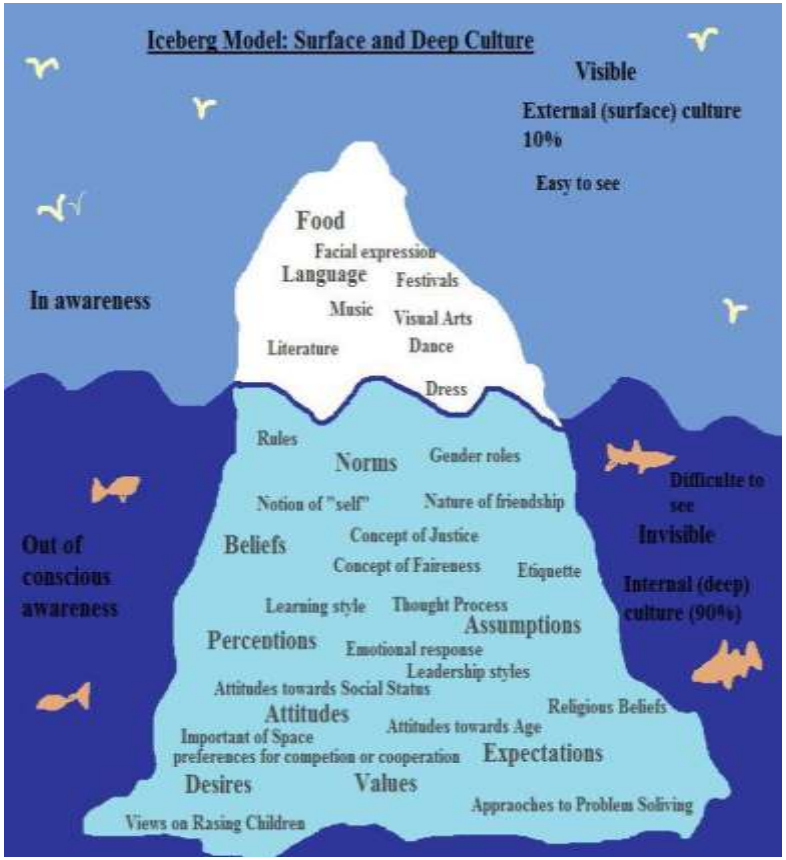
http://sixminutes.dlugan.com/cross-cultural-communication/

1. Culture seems to be an iceberg

Only a small part of culture can be seen

- existing objects are seen
- behavior can be seen
- way of thinking can be really different
- expectations from each others is really different
- acceptance of differences in behavior cause emotions

A part of these feelings are undermined



https://culturalconflict.wordpress.com/2013/11/09/

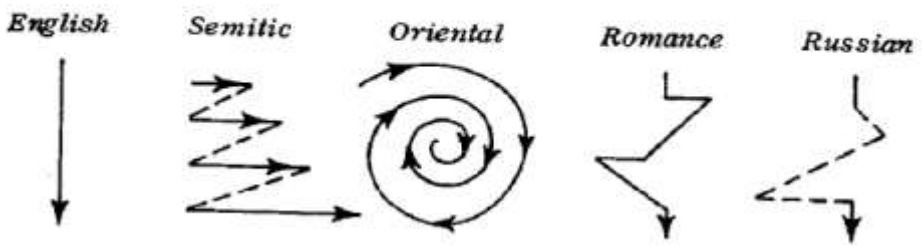
2. Different ways of thinking and saying

There is a diagram of different cultural thought patterns for different language groups.

It can be a guide for developing cultural competence in cross cultural communication,

being speaker or listener.

Kaplan's model



http://www.callearning.com/blog/2010/06/communication-and-cultural-thought-patterns/

3. Levis Model of cultural diversity

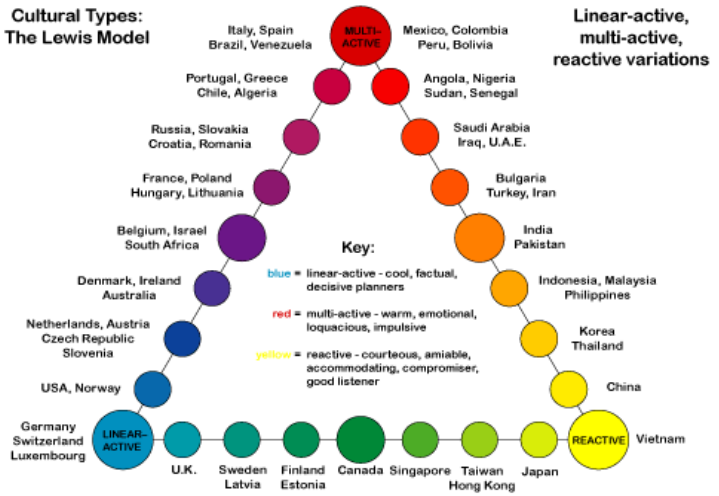
Richard D. Lewis divides cultures into three main categories:

-Linear active

-Multi active

-Reactive

Each culture is a mix, but there are in different places



http://foxhugh.com/multicultural/lewis-model-of-cross-cultural-communication/

4. Definition of Culture by Hofstede

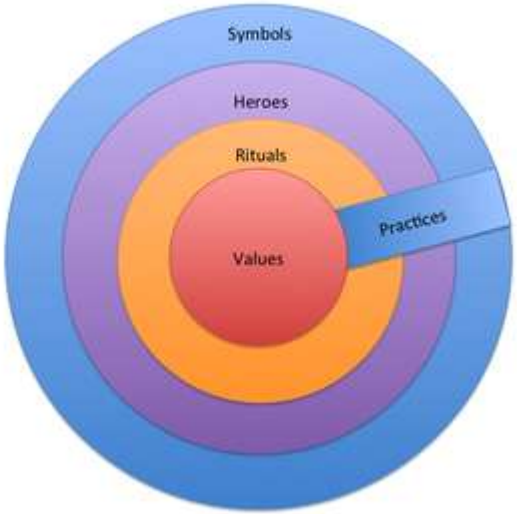
The first layer is about the symbols: *what is seen on the surface*

The second layer is about the „heroes“: *who are the stars in our mind*

The third layer is described as rituals: *what is expected to do in a situation*

The core stands for the values of a certain culture: *what do we feel sa good, fair, correct*

„the onion”



http://www.herr-paul-consulting.com/blog/germany-us-hofstede-cars

5. Dimension to measure National Business Cultures

Prof. Geert Hofstede was working at IBM as a psychologist.

1967-1973 he collected and analyzed data from over 100,000 individuals from 50 countries and 3 regions.

He developed a model that identifies four primary Dimensions to describe cultures.

Later he added a fifth Dimension

that is based on Chinese approach based on Confucian dynamism

The five cultural dimensions are:

(PDI) Power Distance Index

(IDV) Individualism

(MAS) Masculinity

(UAI) Uncertainty Avoidance Index

(LTO) Long-Term Orientation

http://www.tlu.ee/~sirvir/Leadership/Leadership%20Dimensions/dimesnions_of_culture_geert_hofstede.html

6. Inglehart–Welzel Cultural Map

World Values Survey findings

Vertical axe

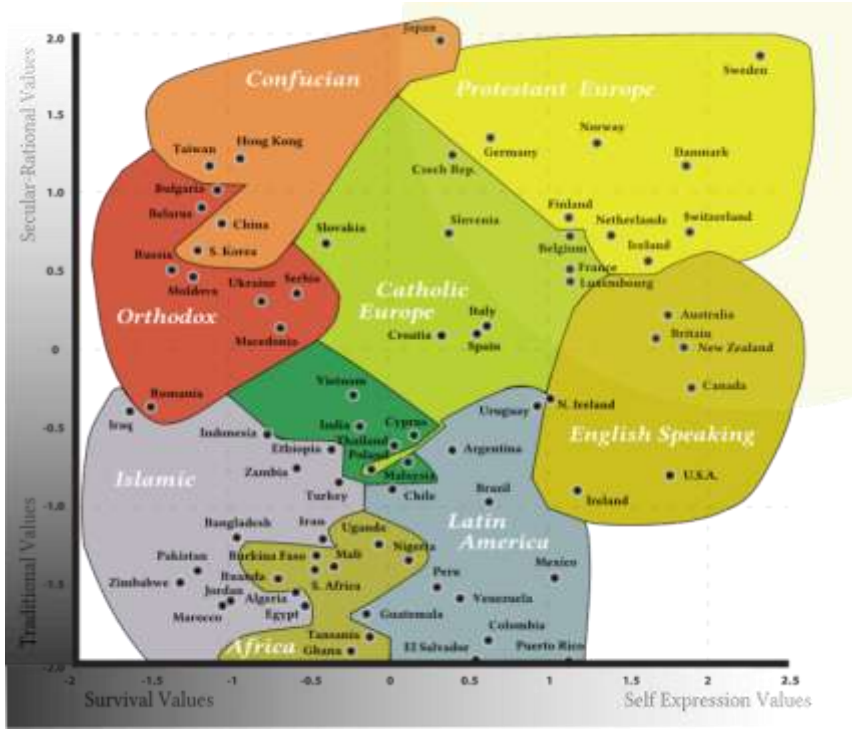
Traditional values: religion, parent-child ties, authority, traditional family values

Secular-rational values: personal freedom (including divorce, abortion, euthanasia and suicide) are acceptable.

Horisontal axe

Survival values: economic and physical security, ethnocentric outlook and low levels of trust and tolerance

Self-expression values: environmental protection, tolerance of foreigners, gays and lesbians and gender equality, participation in decision-making in economic and political life.



https://danutm.wordpress.com/2015/01/16/world-values-survey-inglehart-wenzel-cultural-values-map/

Changing map in time:
http://www.worldvaluessurvey.org/WVSContents.jsp?CMSID=Findings

7. Cross-cultural communications

Effective cross-cultural communication

- Be honest
- Be flexible
- Listen flexible,
- Respect differences
- Ask questions
- Build self awareness
- Avoid stereotyping
- Distinguish perspectives
- Think twice
- Recognize complexity

Think on communications barriers

http://erikocommunicationbarriers.blogspot.hu/2009/03/cross-cultural-communication-barriers.html

8. Unacceptable approaches

It is unacceptable:

- Not to prepare yourself to the cross-cultural diversity
- Expect your partner first fully understand you, before you understand him /her
- Ranking different cultures
- Be nervious from different approaches at the table

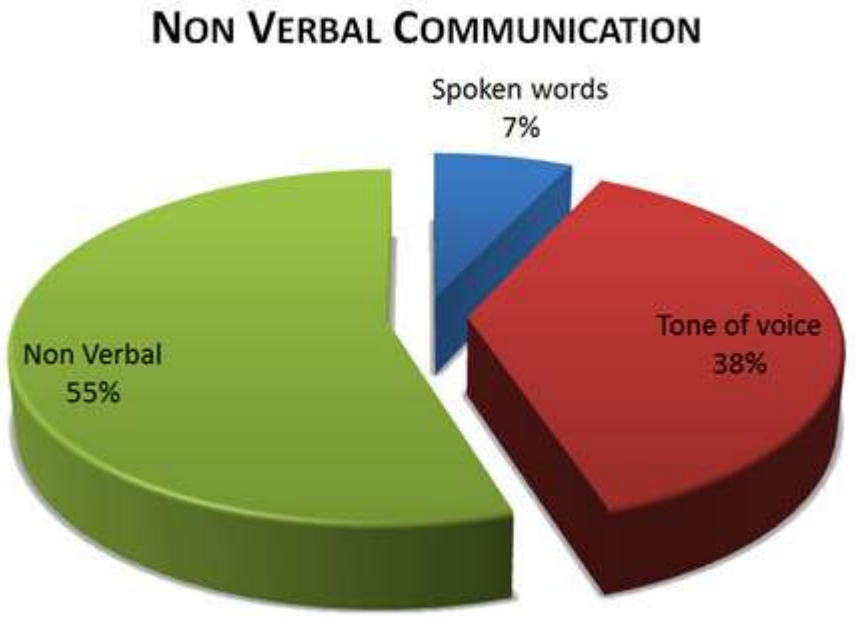
Limits of understanding:

- crime, violence, terrorism, drog-consuming … are not acceptable

https://culturalconflict.wordpress.com/2013/11/24/cross-cultural-misunderstandings/

9. Verbal communication

- Try to be simple and understandable
- Accept the language difficulties of the partner
- Answer directly the questions you get, if it is possible
- Think on Kaplans' model of verbal communication of different directions in speaking
- Be polite but not complicated in language forms



https://www.linkedin.com/pulse/importance-nonverbal-communication-sally-burgos/

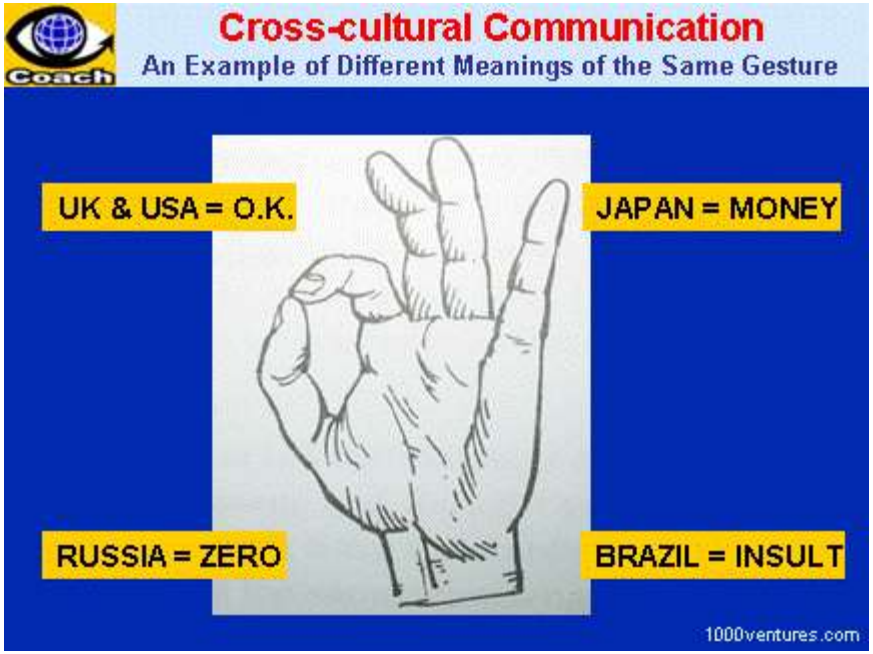
10. Eating & drinking together

- Be honest with the eating traditions: ***prevent Indian vegetarians from meat, Muslims and Jewish from pork.***
- Speak about food specialties of your countries, but do not ask them to eat
- Do not criticize the food you get, ask less if it is strange for you

https://www.designswan.com/archives/helpful-infographic-of-dining-etiquette-around-the-world.html

11. Meta-communications

- Be careful with meta-communications, it may mean completely different things.
- Try to understand the body language of the partner
- Be careful, not to disturb your partner, with your body language.



http://www.1000ventures.com/business_guide/crosscuttings/communication_cross-cultural.html

12. Summary

First step is to understand, that there are cultural differences

- in way of thinking
- in behavior
- in expectation
- in self evaluations
- in understanding of meta communications

Prepare yourself to the cross-cultural communications

- Respect differences, but avoid stereotyping
- Learn about the cultural diversity

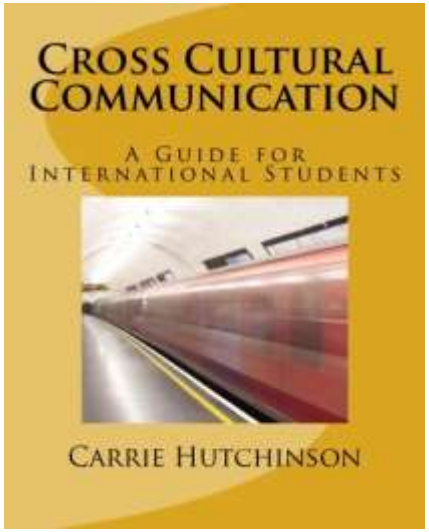
Build up personal credibility and trust in cross cultural communication

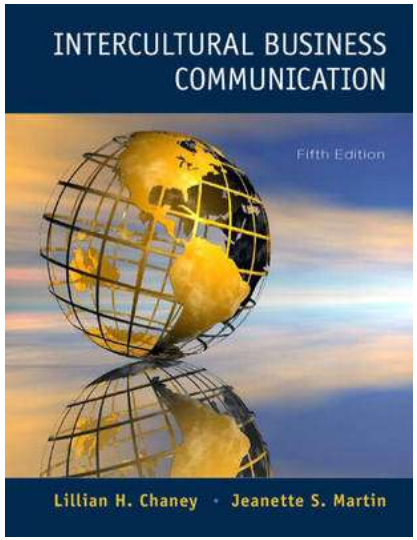
- ❑ Be honest and flexible & think twice
- ❑ Ask questions, if you do not understand something, before evaluating

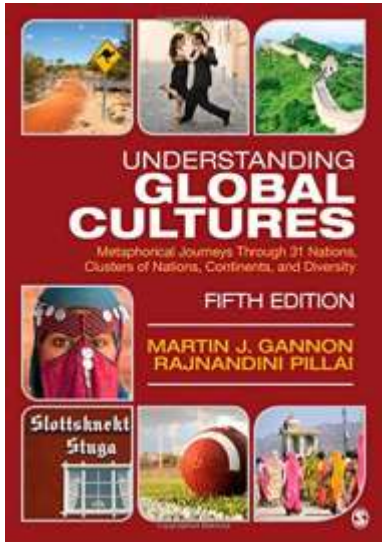
Prepare yourself for eating and drinking together

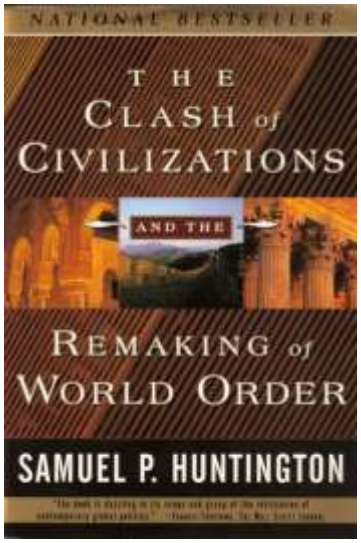
- ❖ Avoid forbidden food and drinks
- ❖ Describe the ingredients of your offered dishes

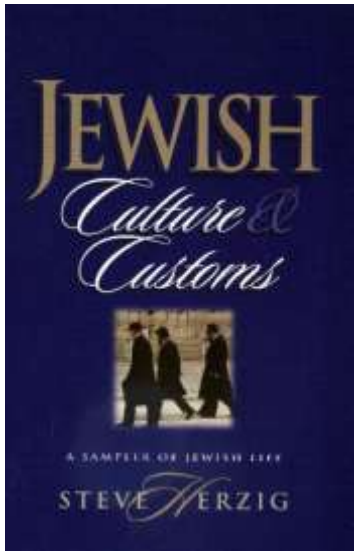
Books on the topic

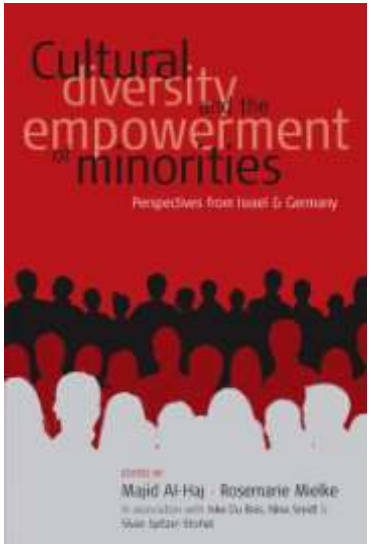












Engineering Management BMEVITMMB03
BME Faculty of EE & IT MSc Majors
Economic & human themes

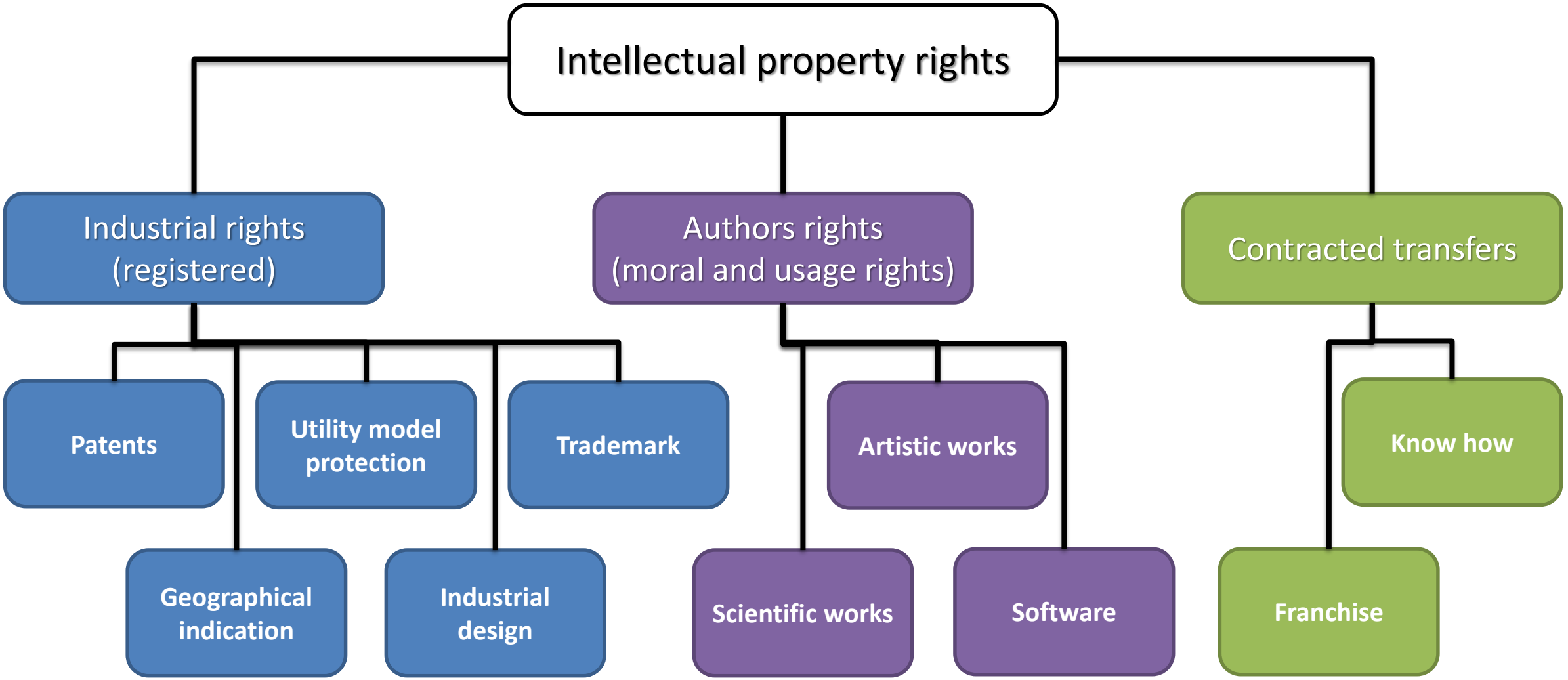
INTELLECTUAL PROPERTY RIGHTS

István Gódor PhD & Zsuzsanna Kósa PhD

BME Dept. Telecommunications and Media Informatics

Budapest, Spring of 2018

Main areas


Intellectual property rights
Industrial rights (registered)
Authors rights (moral and usage rights)
Contracted transfers
Patents
Utility model protection
Trademark
Artistic works
Know how
Geographical indication
Industrial design
Scientific works
Software
Franchise

Protection of intellectual property

- Creating something really new
  - Authors need their whole personality
  - All existing knowledge
  - Their experiences
  - Sometimes experiences of previous generations

Pierre and Marie Curie in 1906 were Nobel-prized researchers of radio activity

Source: http://www.atomicarchive.com/Bios/CuriePhoto.shtml

Protection of intellectual property

- Time and effort spent on creating, can be hardly measured
- Risk caused by the creating process and the creature cannot be measures neither

Pierre died in an accident with bicycle, as a consequence of his exhausted living

Marie died some years later in anemia as a consequence of the radiation

Source: http://www.atomicarchive.com/Bios/CuriePhoto.shtml

Protection of Intellectual property rights tends to compensate the listed drawbacks

INDUSTRIAL RIGHTS

Patents, Utility models, Trademarks, Geographical indication, Design protection

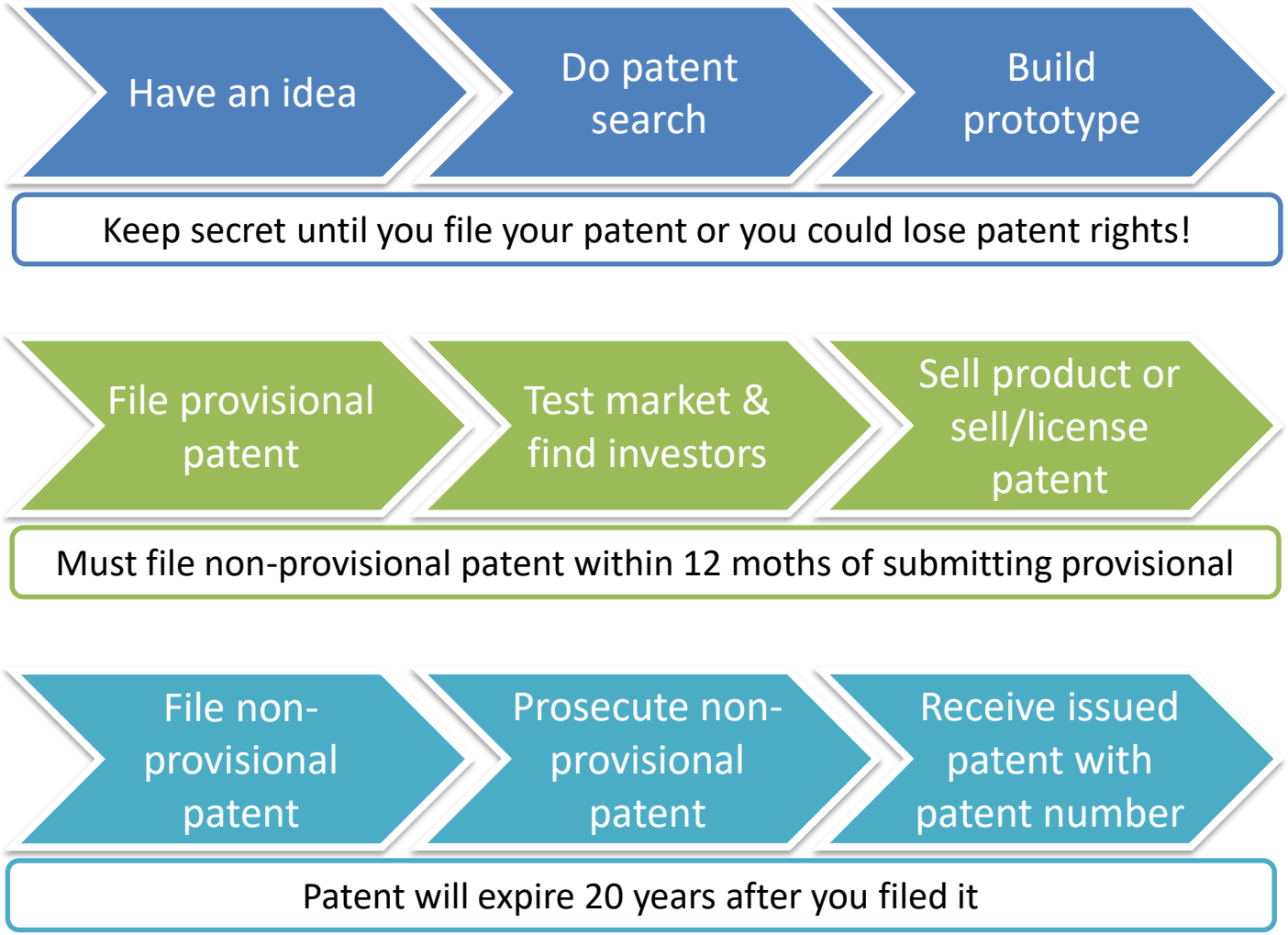
Patents & inventions

- Invention is a new technical solution
- Patent is the legal protection of an invention
  - The owner has an exclusive right to exploit the solution of the invention
  - The patent protection is valid up to 20 years
  - There is an official examination of novelty after the application
  - Searching published patent documents is open to everybody
- Applications for protection
  - National, European, US, etc. application
  - Patent Cooperation Treaty

Source: http://patentfile.org/patent-process-and-invention-timeline/

Patenting overview

1. Have your idea, sharpen to be unique and test your idea
2. Provisional patent, test market and how to utilize the idea
3. If your non-provisional patent is granted enjoy the next 20 years



Source: https://www.epo.org/learning-events/materials/inventors-handbook/disclosure.html

Disclosure and confidentiality

- **Disclosure to individuals** during private meetings
  - This type of risk is controllable as long as you take a few basic precautions (see also below)
- **Public disclosure** (less obvious than private meetings):
  - Media publicity and competitions: both may be useful after you have legally protected your idea but definitely not before it
  - Inventions which originate as student projects - especially if there is a requirement to exhibit or publish your work
    - Teaching staff often do not understand that any form of public display of an idea legally constitutes disclosure and can have serious consequences

Source: https://www.epo.org/learning-events/materials/inventors-handbook/novelty/prior-art.html

Novelty and prior art

- An **idea** can be considered as an **invention** if **at least one significant part** of its technology is **completely novel** (i.e., new)
  - There must be no evidence that this novel aspect of your idea has ever been described before, or used for the same purpose before
  - An idea may be an invention if existing technologies are combined in a way that is novel, or used in a way that is novel
- **Prior art is any evidence** that your invention is already known
- **Competing art is any alternative** solution to your problem, which can damage business possibilities to utilize the idea

Inventive step (1/3)

Is the idea obvious?

Source: https://www.epo.org/learning-events/materials/inventors-handbook/novelty/obvious.html

- To be regarded as an invention, an idea needs to include an inventive step
  - An **inventive step must be non-obvious** - that is, it would not readily occur to an expert in the relevant technology

- Judging what might be obvious can be very difficult (to be cont'd)
  - **"Obvious" combination**: many inventions involve combining equipment (for example, fitting a miniature torch to a key-ring). The result of such combinations might be a new product, but its properties or functionality might be entirely predictable as soon as one knew its components. As such, it could be considered obvious.

Inventive step (2/3)

Is the idea obvious?

Source: https://www.epo.org/learning-events/materials/inventors-handbook/novelty/obvious.html

- Judging what might be obvious can be very difficult (to be cont'd)
  - **"Simple replacement":** a product in which one component has been replaced for a different one with equivalent properties could be considered to be obvious (for example, a small metal spring is replaced with a rubber cone).
  - **"Only solution":** there might be a new problem which can be solved with a well known piece of equipment: the "novel" process for solving this problem might be considered obvious if there was only one solution to the problem, and it would be known to the typical technician facing the problem (so-called "person skilled in the art").

Inventive step (3/3)

Is the idea obvious?

Source: https://www.epo.org/learning-events/materials/inventors-handbook/novelty/obvious.html

- Judging what might be obvious can be very difficult
  - **"Better than sum":** when components are combined to make a product or process with properties which are greater than the sum of its parts, or better than expected, then that could be non-obvious.
  - **"Find best solution":** an invention could come from where there are many possible solutions to a problem, but the inventor has had to research and select the best one, that could be non-obvious.
  - **"Something unexpected":** an inventor might defy some technical prejudice and solve a problem by doing something every other expert had previously believed would not work, that could be non-obvious.

Source: https://www.epo.org/learning-events/materials/inventors-handbook/novelty/searching.html

Prior art search (1/4)

- Two prior art search processes: a **product search and a patent search**
  - Do not ignore evidence you do not like. The purpose of a prior art search is to go looking for evidence you may not like.
  - An absence of prior art at the time of your searches may not be a permanent absence. You should update your prior art searches periodically as you develop your idea.
  - No prior art search - not even an official Patent Office examination - is regarded in law as conclusive proof of novelty.

Source: https://www.epo.org/learning-events/materials/inventors-handbook/novelty/searching.html

Prior art search (2/4)

- Finding the right keywords or search terms which best describe your idea since the most obvious key words may be unhelpful
  - E.g., “Mousetrap” produces over millions of hits, but “Rodent trap” (what else it is) and “trapping mice” (what it does) produces 20,000 and 700 hits respectively (see telco examples on later slides!)

- Product searching (what is already on the market)
  - Similar to your idea (prior art) or tackles the same problem (competing art)
  - Obsolete technologies or products may be prior art, so check historical as well as current sources of information

Source: https://www.epo.org/learning-events/materials/inventors-handbook/novelty/searching.html

Prior art search (3/4)

- Patent searching
  - For many ideas, patent searching will be far more important than product searching. Although many products on the market do not have a patent, they are probably heavily outnumbered by the many ideas that are successfully patented but never reach the market.

- Patent searching involves two skills
  - Finding every patent document that is relevant to your invention
  - Interpreting the significance of your patent search findings
    - Give a try at, e.g., https://worldwide.espacenet.com/

Prior art search (4/4)

Companies may consider only patent offices as safe search places or just a dedicated partner

- European Patent Office (EPO) / Espacenet
  - https://worldwide.espacenet.com/
- Clarivate Analytics (former Thomson-Reuters search)
  - https://clarivate.com/product-category/scientific-academic-research/
  - https://clarivate.com/product-category/patent-research-intelligence-and-services/
- World Intellectual Property Organization (WIPO)
  - https://patentscope.wipo.int/search/en/search.jsf
- US Patent & Trademark Office (USPTO)
  - http://appft.uspto.gov/netahtml/PTO/search-bool.html
- Google Scholar
  - https://scholar.google.com/

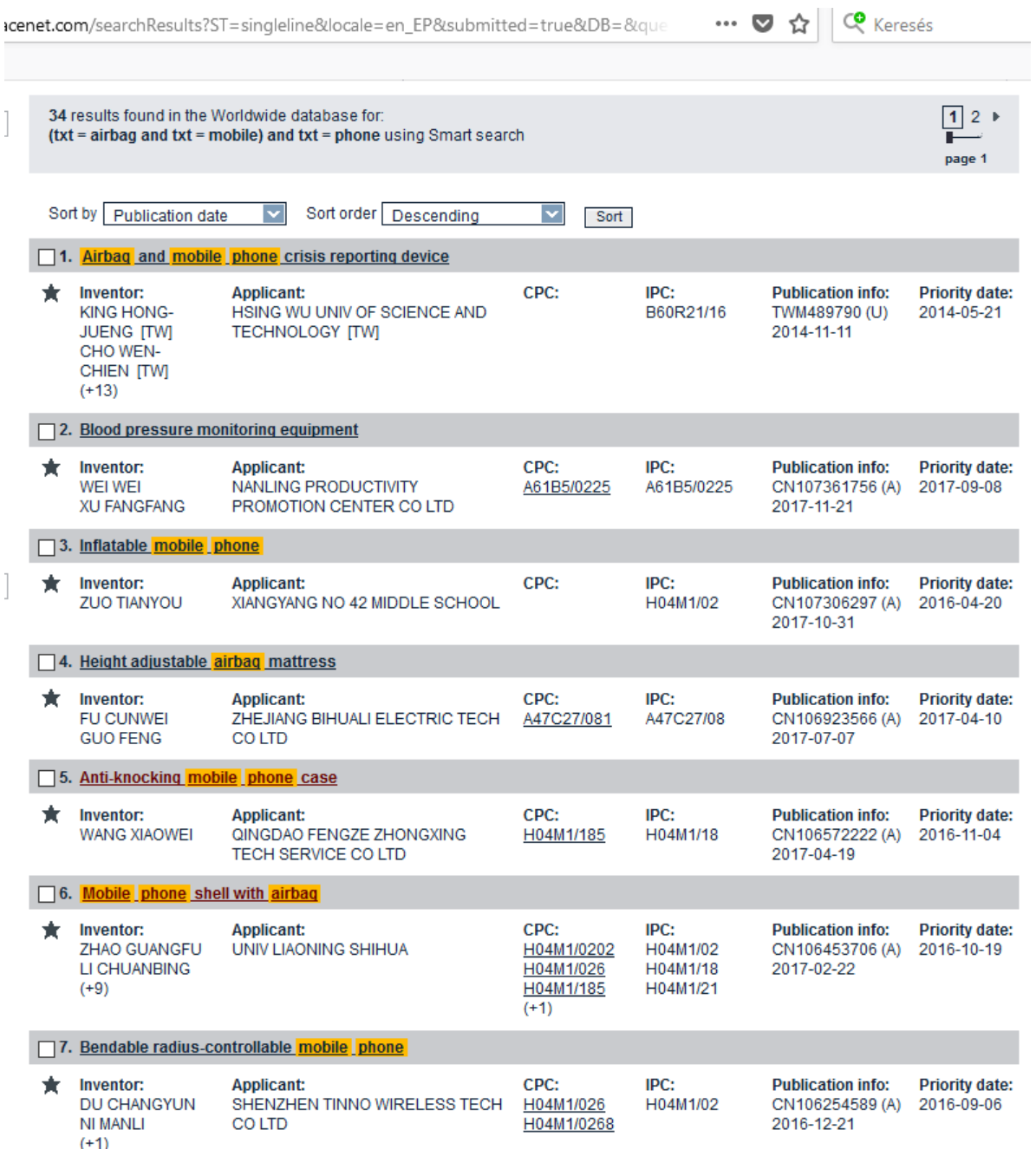
Example 1

Hard to create a novel idea (1/2)

- Since Alexander Graham Bell and Thomas Alva Edison, the world changed much, now “millions” of engineers working on similar topics

- At first, mobile phone with airbag seems to be a novel idea, but...

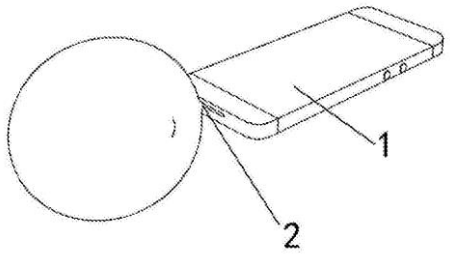
  https://worldwide.espacenet.com/searchResults?ST=singleline&locale=en_EP&submitted=true&DB=&query=mobile+phone+airbag



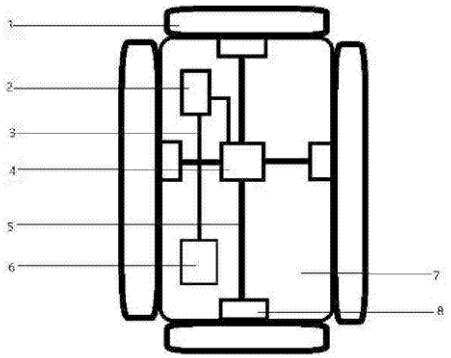
Example 1

Hard to create a novel idea and describe it well (2/2)

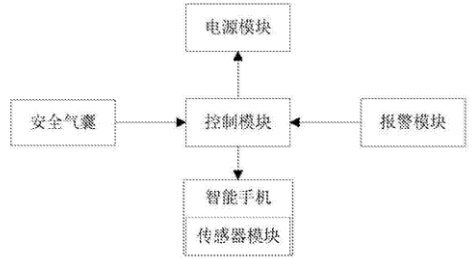
- Inflatable mobile phone (link)
  - After the mobile phone is dropped into water, a sensing trigger at a tail end of the mobile phone triggers the airbag to open, therefore the mobile phone does not sink into the water ...
- Mobile phone shell with airbag (link)
  - ... measuring the falling accelerated speed of a mobile phone ... and popping up the airbag in time ...
- Falling prevention mobile phone device (link)
  - ... if the falling status of the mobile phone is determined, an alarm signal is sent, and the airbag is ejected to protect the mobile phone ...



Drawing well inline with text



Abstract drawing

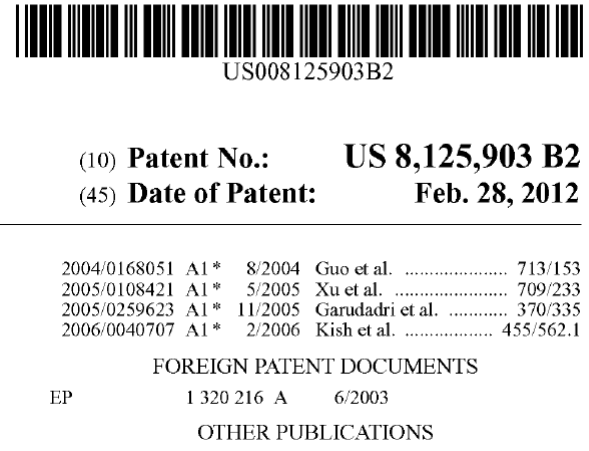


No drawing about realization

Example 2

Find prior art needs the right search terms / synonyms

- **Patent idea:** optimize distribution of media content to users with different quality needs (represented by layers of media) simultaneously in a wireless network
  - Network: more than able to list
  - Mobile: more than able to list
  - Wireless: more than able to list
  - Distribution: more than able to list
  - Multicast: more than able to list
  - Wireless + multicast: approx. 5000
  - Layered: more than able to list
  - Media: more than able to list
  - Layered media: approx. 1200
  - Multicast layered media: 13
  - Wireless multicast layered media: 3 !!!



US008125903B2

(12) **United States Patent**
Gódor et al.

(10) **Patent No.: US 8,125,903 B2**
(45) **Date of Patent: Feb. 28, 2012**

(54) **WIRELESS MULTICAST FOR LAYERED MEDIA**

(75) Inventors: **István Gódor**, Budapest (HU); **Ákos Kovács**, Budapest (HU)

(73) Assignee: **Telefonaktiebolaget LM Ericsson (publ)**, Stockholm (SE)

2004/0168051 A1* 8/2004 Guo et al. 713/153
2005/0108421 A1* 5/2005 Xu et al. 709/233
2005/0259623 A1* 11/2005 Garudadri et al. 370/335
2006/0040707 A1* 2/2006 Kish et al. 455/562.1

FOREIGN PATENT DOCUMENTS

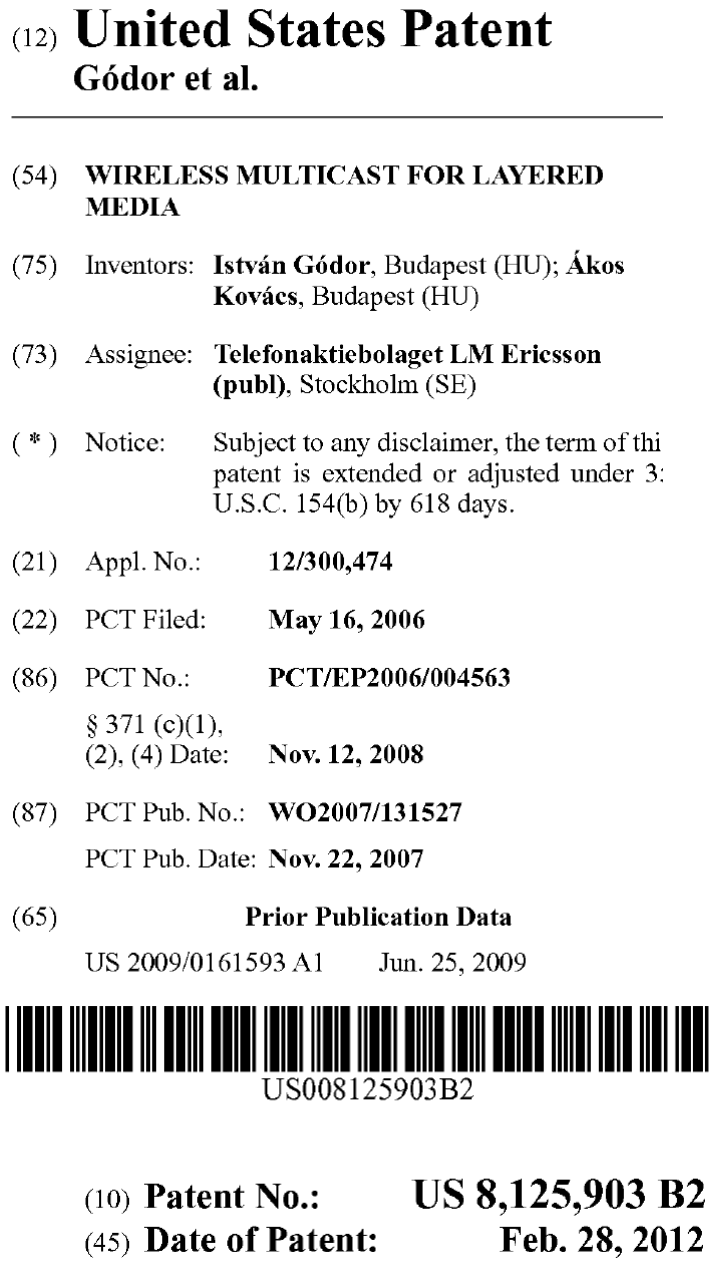
EP 1 320 216 A 6/2003

OTHER PUBLICATIONS

Structure of a patent (1/4)

Header of front page

- Title
- Inventors
  - Inventor(s) should be a natural person, who created the new invention
  - Employees, who have invented within their duties would produce invention for his/her employer
  - Employees who have invented something out of the official duties, the employer should be the first buyer of the usage rights
- Assignee
- Important dates & patent reference numbers



(12) **United States Patent**
Gódor et al.

(54) **WIRELESS MULTICAST FOR LAYERED MEDIA**

(75) Inventors: **István Gódor**, Budapest (HU); **Ákos Kovács**, Budapest (HU)

(73) Assignee: **Telefonaktiebolaget LM Ericsson (publ)**, Stockholm (SE)

(*) Notice: Subject to any disclaimer, the term of thi patent is extended or adjusted under 3: U.S.C. 154(b) by 618 days.

(21) Appl. No.: **12/300,474**

(22) PCT Filed: **May 16, 2006**

(86) PCT No.: **PCT/EP2006/004563**
§ 371 (c)(1),
(2), (4) Date: **Nov. 12, 2008**

(87) PCT Pub. No.: **WO2007/131527**
PCT Pub. Date: **Nov. 22, 2007**

(65) **Prior Publication Data**

US 2009/0161593 A1 Jun. 25, 2009

US008125903B2

(10) **Patent No.: US 8,125,903 B2**
(45) **Date of Patent: Feb. 28, 2012**

Structure of a patent (2/4)

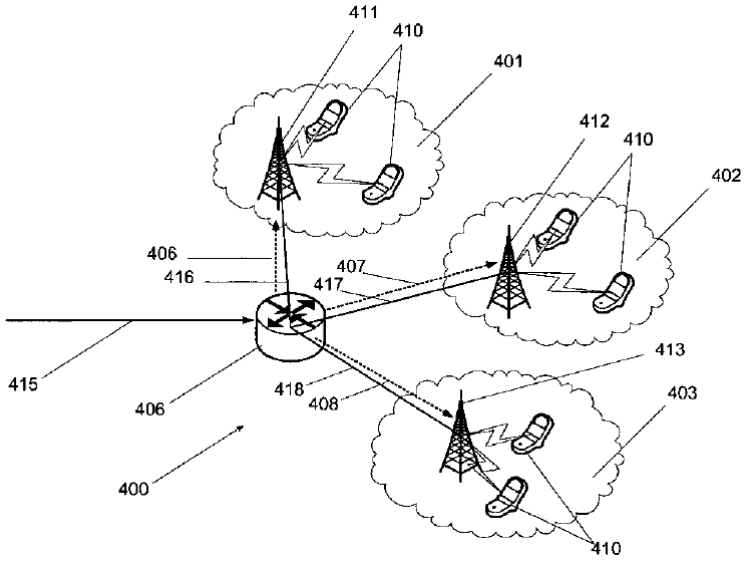
Introduction on front page

- Abstract
  - Brief technical summary about the merit of the invention
  - **Note**: in contrast to the title of the invention (which is many times obfuscated like formulating as “method for managing networks”), the abstract shall be clear
- Main figure illustrating the idea (not always added in the front page, but helps a lot)

(57) **ABSTRACT**

A method and arrangement in a wireless communication network for optimizing data rates when communicating layered multicast data. In an initial probing phase, the receiving capability of each user equipment (UE) in each cell is collected. The optimal data rate for each layer is then calculated and packets are transmitted to the UEs at the optimal rates. The UEs may periodically send updated receiving capabilities so that the optimal data rates can be updated. Additionally, the network may periodically obtain the updated receiving capabilities through secondary probing at unused data rates.

17 Claims, 6 Drawing Sheets



Structure of a patent (3/4)

Positioning the patent

- Technical field
  - Very briefly introduces the field of invention
- Background of the invention
  - A kind of prior art analysis highlighting the main differentiators
  - Might include the bottlenecks of prior art
- Summary of the invention
  - What is novel, what are the advantages, etc.
- Brief description of the drawings
  - Just introduce the figures (like figure captions)

TECHNICAL FIELD

The present invention relates to wireless communication and in particular to an optimization of radio resources in a layered media environment.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention will be described in a non-limiting way and in more detail with reference to exemplary embodiments illustrated in the enclosed drawings, in which:

FIG. **1** illustrates schematically nested data rates in the areas of WLAN 802.11b networks;

FIG. **2** illustrates schematically in a block diagram a method according to the present invention;

Structure of a patent (4/4)

Details and claims

- Drawings (might be presented at the beginning or at the end)
- Detailed description (of preferred embodiments)
  - Description detailed enough to reproduce the idea
  - There could several so-called embodiments, which are practical variants or extensions to cover different “use-cases”
- Claims (to be cont’d with examples)
  - Rigorous description of technical claims (even defining computer storage types as a list, e.g., storage devicefloppy, CD, HDD, SSD)
  - Each important item is a separate claim
  - Typically sound like a complex legal statements aiming to cover the widest range of possible fields around the invention

Example claims

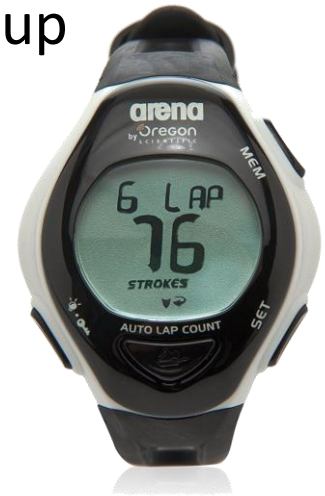
9. “A gateway in a wireless communications network for optimizing data rates when communicating multicast data, for enabling multimedia transport protocol, and for forwarding data **to at least one** user station, said gateway **including a processor coupled to a non-transitory memory**, wherein when **the process executes computer program instructions stored in the non-transitory memory**, the **computer program instructions stored in the non-transitory memory cause** the gateway to

   Receive data packets; obtain available data rates for muticast data corresponding to at least one user stations; compute an optimal data rate for each user stations;” */etc., here come some more functions/*

10. “The gateway **according to claim 9, wherein** the gateway is also configured to maximize either an average data rate within an access network cell, or a data rate per user within the access network cell.”
11. “The gateway **according to claim 9, wherein** the gateway is configured to obtain the available data rates by receiving an Internet Group Management Protocol (IGMP) message.”
12. “The gateway **according to claim 9, wherein** the gateway is communicatively connected to a data storing arrangement with stored data rates available for each user.”

Usage and piracy of a patent (1/4)

- Patentee assures that the industrial solution is functionally applicable
  - Such that teleporting and time-travelling cannot be patented (yet)
- **Patent holder may allow to use the invention**
  - But typically licensing fee should be payed for him/her or the company behind
- Fair pricing is expected, but not typical in all domains
  - E.g., the two largest swimming brands had to give up licensing swim watch technology from small companies, while these small companies "*do completely miss swimmers, but focusing only on triathlon*" (personal view of professional swimmers)



Source: Arena

Source: Speedo

Usage and piracy of a patent (2/4)

- Patent trolls
  - Pejorative term applied to person or company that attempts to enforce patent rights against accused infringers far beyond the patent's actual value or contribution to the prior art
  - Patent trolls often do not manufacture products or supply services based upon the patents in question
  - Not-so-pejorative terms: Patent Assertion Entity (PAE), Patent Holding Company (PHC) or non-practicing entity (NPE)
- Having many patents without being troll
  - Research institutes or university laboratories might have many patents that they either offer their patents to public good or at reasonable price to manufacturers

Usage and piracy of a patent (3/4)

- Telecom patents
  - Most effective (“best”) patents are standard blocking
  - Fair pricing is expected, most company do this since wholesale allows it
  - But head-by-head comparison between large players
    - Whose patent tower is larger?
  - Large lawsuits even with suppliers
    - Apple vs. Samsung
    - Even based on hardly true evidences (like modified images of design in the above case)
  - Research institutes can have extremely large impact (compared to size within company)

Usage and piracy of a patent (4/4)

- **Patentee is not expected to assure profitability of the invention**
  - Consider a chamber pot with a handle inside, which is non-obvious improvement to avoid broken handles
  - But hardly anybody would buy it ☺
- **In case of piracy patent holder is allowed to go to the court and claim for**:
  - Inform the public about piracy
  - Stop the further business based on piracy
  - Compensation from the pirate

Source: Pixabay Creative Commons

Example

World's most innovative companies in 2017

Source: https://247wallst.com/special-report/2018/01/10/the-worlds-50-most-innovative-companies

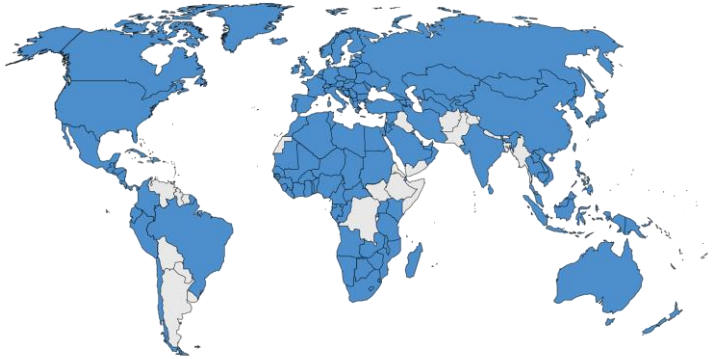
1. IBM
2. Samsung
3. LG Electronics
4. Intel
5. Canon
6. Alphabet
7. Qualcomm
8. Toyota Motors
9. Microsoft
10. TSMC
11. Sony
12. Apple
13. Toshiba
14. BoE Systems
15. Amazon
16. Mitsubishi
17. Ford Motor
18. Panasonic
19. General Electric
20. Huawei Technologies
21. Fujitsu
22. Ericsson
23. Hitachi
24. Hyundai Motor
25. Seiko Epson
26. Siemens
27. AT&T
28. Robert Bosch Gmbh
29. Boeing
30. Ricoh
31. Kyocera
32. General Motors
33. Xerox
34. Infineon Technologies
35. HP
36. Semiconductor Energy Laboratory
37. Cisco Systems
38. NXP Semiconductors
39. GlobalFoundries
40. SK Hynix
41. Denso
42. Texas Instruments
43. Honda Motor
44. Koninklijke Philips
45. Nokia
46. Honeywell International
47. NEC
48. Micron Technology
49. Oracle
50. Sharp

Main steps of patenting procedure

1. Filing
2. Formal examination
3. **Novelty search**
4. Publication
5. Substantive examination
6. Examination fee ...
7. **Approval before the grant of a patent**
8. **Grant of patent**
   - If the application and the invention meet all the requirements,
   - the patent office shall grant a patent and
   - issues a patent certificate to the applicants.
9. **Definitive protection has a term of 20 years**
   - Protection fee should be paid

Source: http://www.wipo.int/pct/en/

International patent process (1/3)



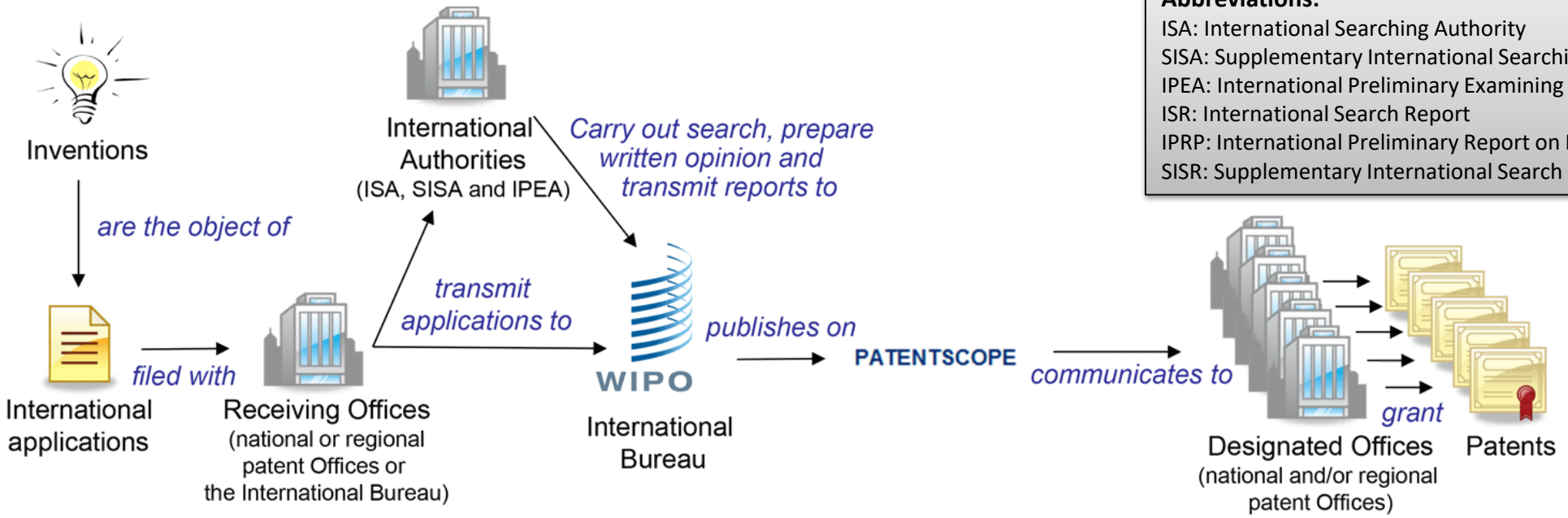
152 PCT contracting countries

- **Patent Cooperation Treaty (PCT)**
  - Assists applicants in seeking patent protection internationally for their inventions
  - By filing one international patent application under the PCT, applicants can simultaneously seek protection for an invention in a very large number of countries
  - The treaty is under **World Invention and Patent Organization (WIPO)**
    - Claim per country with a common period and separate national periods in each countries
    - The Patent Office organize an Worldwide examination of novelty
  - The European Patent Convention
    - It is a harmonized application for patent in the EU

Source:
http://www.wipo.int/pct/en/faqs/faqs.html

International patent process (2/3)

Abbreviations:
ISA: International Searching Authority
SISA: Supplementary International Searching Authority
IPEA: International Preliminary Examining Authority
ISR: International Search Report
IPRP: International Preliminary Report on Patentability
SISR: Supplementary International Search Report



Further useful links

About international patenting

- http://www.the-business-of-patents.com/wipo-patents.html
- http://www.sztnh.gov.hu/English/szabadalom/pct_ut/jogforras_szab.html#nemzetkozi
- http://www.wipo.int/pct/en/pct_contracting_states.html
- http://www.wipo.int/pct/en/activity/
- http://en.wikipedia.org/wiki/Patent_Cooperation_Treaty

Source: http://www.wipo.int/patents/en/topics/utility_models.html

Utility model protection (1/3)

- It is a legal protection for the **new technical solutions** not reaching the level of a patentable invention (available less than half compared to PCT countries)
  - In some countries, utility models can be applied for in the **same fields of technologies as patents**
  - In other countries, utility model protection is eligible **only for the shape or structure of products** in certain fields of technology, such as **mechanical devices and apparatus**, but not for technical, chemical and biological processes

    - **Note**: eligible subject matter for utility models varies significantly from one country to another

Source:
http://www.wipo.int/patents/en/topics/utility_models.html

Utility model protection (2/3)

- Utility models
  - Less strict requirements
  - Novelty needed with lower level of inventive step or non-obviousness
  - Often considered incremental innovation
  - Protection for 6 to 10 years
  - Simpler registration process taking 6 months or less
  - Lower fees for process
  - Sometimes only for products
- Patents
  - More strict requirements
  - Novelty needed with proven inventive step and non-obviousness
  - Often considered “the real” innovation
  - Protection for 20 years
  - Complex process taking 30 months or even more (see PCT slides above)
  - Higher fees for process
  - Both for products and processes

Utility model protection (3/3)

Source:
http://www.wipo.int/patents/en/topics/utility_models.html
http://www.sztnh.gov.hu/en/utility-model-protection

- The owner of a utility model obtains **the exclusive right to exploit** the utility model
  - Prevent or stop others from commercially exploiting the utility model for a limited period
  - Or to license another person to exploit it
  - The protection has a term of 6 to 10 years from the filing date, then the utility model become part of the public domain

    - **Note**: utility model protection means that the invention cannot be commercially made, used, distributed, imported or sold by others without the utility model owner's consent. **The above right is territorial**, i.e. the right can be enforced only within the country in which a utility model is granted

Source:
http://www.wipo.int/trademarks/en/
http://www.sztnh.gov.hu/English/vedjegy/

Trademarks (1/2)

- A trademark is any **sign which is capable of being represented graphically and distinguish** the goods or services (cf. servicemark)
- It is a tool of competition
- Owner has the **exclusive rights to use**, but he/she should build up the image
- For 10 years, which may be extended through further periods of 10 years on the registered owner's request
- It is possible to ask for the common EU

Source:
http://www.wipo.int/trademarks/en/
http://www.sztnh.gov.hu/English/vedjegy/

Trademarks (2/2)

- Signs may include words, including personal names, designs, letters, and the shape of goods and their packaging
  - **Coined words** (or fanciful words): these are invented words without any real meaning in any language (e.g. Kodak or Exxon) with the advantage of being easy to protect as they are more likely to be considered distinct
  - **Arbitrary marks:** consist of words having a real meaning in a given language, but without relation to the product itself or to any of its qualities (e.g. Apple, Shell)
  - **Suggestive marks:** hint at one or some of the attributes of the product like quality or lifetime (e.g., Everlast, The North Face)

Geographical indication (1/2)

Source:
http://www.wipo.int/geo_indications/en/
http://www.sztnh.gov.hu/English/foldrajzi_arujelzo/

- Geographical indication (GI) is a sign used on products that have a **specific geographical origin** and possess qualities or a reputation that are due to that origin
  - There is a clear connection between the quality of a given product and its original place of production
  - It could be protected by other industrial property rights
- A geographical indication right enables those who have the right to use the indication to prevent its use by a third party whose product does not conform to the applicable standards
  - Does not enable the holder to prevent someone from making a product using the same techniques as those set out in the standards for that indication

Geographical indication (2/2)

Source:
http://www.wipo.int/geo_indications/en/
http://www.sztnh.gov.hu/English/foldrajzi_arujelzo/

- Geographical indications are typically used for agricultural products, foodstuffs, wine and spirit drinks, handicrafts, and industrial products

Photo: Fuzyboy

Roquefort cheese
The unique blue cheese from France is aged in natural caves around the Roquefort-sur-Soulzon region

Photo: Liz West

Pinggu peaches
The Pinggu district north of Beijing, China, bills itself as the biggest peach farm in the world, providing employment for over 150,000 people

Photo: http://www.tokajiborvidek.hu/

Tokaji wine
Geographical indications help the ancient Tokaji wine industry to unlock its potential

Source: http://www.wipo.int/designs/en/
http://www.sztnh.gov.hu/English/formaterv/

Industrial design (1/2)

- The treaties that WIPO administers, together with national and regional laws, make up the **international legal framework for industrial designs**
- Design protection grants legal protection for the appearance of a product
  - An industrial design may consist of three dimensional features, such as the shape of an article, or two dimensional features, such as patterns, lines or color
  - Should be new on a worldwide level and have individual character
  - The owner has the right to prevent third parties from making, selling or importing articles bearing or embodying a design which is a copy, or substantially a copy, of the protected design, when such acts are undertaken for commercial purposes

Source: http://www.wipo.int/designs/en/
http://www.sztnh.gov.hu/English/formaterv/

Industrial design (2/2)

- Depending on the particular national law and the kind of design, industrial designs **may also be protected** as works of art **under copyright law**
- **Duration:** for 5 years beginning on the filing date of the application
  - Term can be renewed for further periods of five years each, four times at the most
  - Maximum duration is 25 years
- The right holder can create or strengthen his position on the market

Photo: Procter&Gamble

Business success
Contribute to both innovation and brand building

Photo: Hermes Sellier

Fashion
Industrial design law is at the heart of the European fashion industry

AUTHORS RIGHTS – COPYRIGHT

Artistic works, Scientific works, Software

Source:
http://www.wipo.int/treaties/en/ip/wct/
http://www.sztnh.gov.hu/English/szerzoijog/

Copyright (1/4)

- Copyright regulates the protection of the authors of authorial works
  - Any individual, original creation originating from creative intellectual activity
  - In the fields of literature, science and art in which the given creation is embodied
  - Time limit should be equal to or longer than 50 years after the creator's death, longer periods of protection may however be provided at the national level
- **Berne Convention for the Protection of Literary and Artistic Works**
  - Adopted in 1886 with the means to control **how their works are used, by whom, and on what terms**

- **WIPO Copyright Treaty (WCT)**
  - A special agreement under the Berne Convention which deals with the protection of works and the rights of their authors **in the digital environment**

Source:
http://www.wipo.int/treaties/en/ip/wct/
http://www.sztnh.gov.hu/English/szerzoijog/

Copyright (2/4)

- The protection of copyright belongs to the author **from the time of the creation of the work**
  - No application or registration at any authority - or payment of fees pertaining thereto - is needed in this respect
- **Economic rights**, which allow the rights owner to derive financial reward from the use of his works by others
  - The economic rights can be inherited or sold, sometimes in advance
  - Under an employment contract, economic rights shall be transferred to employer
- **Moral rights**, which protect the non-economic interests of the author
  - The author's moral rights cannot be assigned

Source:
https://en.wikipedia.org/wiki/Copyright_policies_of_academic_publishers

Copyright (3/4)

- **Scientific / academic publishing**
  - **Traditionally**, the author of an article was required to transfer the copyright to the journal publisher (to coordinate permissions for reprints or other use), but often it is allowed to submit the author's version of the accepted paper (the unedited manuscript) to
    - A funding body's archive
    - Their institution's repositories
    - Their personal websites
    - Or even for public release six months / one year after publication
  - In **open access**, the publisher has permission to edit, print, and distribute the article commercially, but the author(s) retain the other rights themselves

Source: https://en.wikipedia.org/wiki/Software_copyright

Copyright (4/4)

- **Licensed software**
  - Economic rights for **software code and database** …
  - Similar to other artistic productions, like books, paintings or music
  - Agreements are often labeled as end-user license agreements (EULAs)
- **New approach: free or open source software**
  - The GNU General Public License (GNU GPL or GPL): copyleft
    - Guarantees end users the freedom to run, study, share and modify the software
  - Berkeley Software Distribution (BSD) and MIT License: permissive free software
    - Imposing minimal restrictions on the use and redistribution of covered software
    - E.g., permits reuse within proprietary software provided that all copies of the licensed software include a copy of the MIT License terms and the copyright notice

Example

Image citation

Source:
http://guides.library.ubc.ca/c.php?g=698822&p=4965735
https://creativecommons.org.au/content/attributingccmaterials.pdf

- What to include when attributing
  - Credit the creator, provide the title of the work and URL where it is hosted
  - Indicate the type of license it is available under, provide a link to the license and keep intact any copyright notice associated with the work
- Online image databases and web sites
  - With Creative Commons (CC) Licenses
    - Many of the free databases, like Flickr and Wikimedia Commons
    - Users of the work shall attribute the creator and provide any relevant copyright information
  - With individual licenses or permission statements
    - Terms of use define how and where to reuse/publish at what cost

Note: licensed image databases, print and electronic publications might have complex terms of use

Further useful links

- 4 Things YOU Should Know About Copyrights on the MLS, with Ward Arendt, Chairman of the HAR MLS Advisory Group
  - http://houstonagentmagazine.com/3-things-you-should-know-about-copyrights-on-the-mls-with-ward-arendt-chairman-of-the-har-mls-advisory-group/
- WIPO Copyright Treaty (WCT) http://www.sztnh.gov.hu/jogforras/Copyright_Treaty.pdf
- Creative Commons
  - http://creativecommons.org/ and http://en.wikipedia.org/wiki/Creative_Commons
- Software
  - https://en.wikipedia.org/wiki/GNU_General_Public_License
  - https://en.wikipedia.org/wiki/BSD_licenses
  - https://en.wikipedia.org/wiki/MIT_License

CONTRACTED TRANSFERS

Know how, Franchise

Know how (1/2)

Source:
https://definitions.uslegal.com/k/know-how-intellectual-property-rights
https://en.wikipedia.org/wiki/Know-how

- In the context of intellectual property (IP), know how is a **component in the transfer of technology in national and international environments**, co-existing with or separate from other IP rights such as patents, trademarks and copyright and is an economic asset
  - When it is transferred by itself, know-how should be converted into a trade secret before transfer in a legal agreement
  - Can relate to other IP rights
- It is considered an intangible property in which rights may be bought and sold
  - It is a contracted form, without direct regulation

Know how (2/2)

Source:
https://definitions.uslegal.com/k/know-how-intellectual-property-rights
https://en.wikipedia.org/wiki/Know-how

- Know how means any form of
  - **Technical information or assistance** relating to the manufacture or placing into operation of the said products
  - **Any practical knowledge, techniques, and skill** that are required to achieve some practical end
  - The technical skill which large groups of men acquire through extensively financed experimentation and cooperation
- Employee knowledge
  - Employees have a duty of good faith and fidelity until their employment ceases
    - “You must keep all information about your previous employment with us secret for 4 years” would be difficult to support because that person has to be able to use the skills and knowledge they learnt to gain employment elsewhere

Source: http://www.thefranchisebuilders.com/types-franchise-2/

Franchise (1/3)

- Franchise is a network among independent firms, where the franchise holder transfers knowledge to the network

- **Product Distribution Franchise**
  - Similar to supplier-dealer relationship, however, the franchisee is required to observe a few guidelines e.g. agreeing to sell only the franchisor's brand exclusively
  - Deal mainly with large products such as automobiles and auto repair parts, vending machines, computers and some inventory for convenience stores

Source: http://www.thefranchisebuilders.com/types-franchise-2/

Franchise (2/3)

- **Business Format Franchise**
  - The franchisee distributes the franchisor's products and services under the franchisor's trade mark, as well as implements the franchisor's format and procedure of conducting the business

- **Management Franchise**
  - The franchisee provides the management expertise, format and/or procedure for conducting the business

Franchise (3/3)

Top global franchises (2018)

Source:
http://www.thefranchisebuilders.com/types-franchise-2/
https://www.franchisedirect.com/top100globalfranchises/rankings

1. McDonald’s (Fast Food Franchises)
2. KFC (Chicken Franchises)
3. Burger King (Fast Food Franchises)
4. Pizza Hut (Pizza Franchises)
5. 7 Eleven (Convenience Store Franchises)
6. Marriott International (Hotel Franchises)
7. RE/MAX (Real Estate Franchises)
8. Dunkin' Donuts (Bakery & Donut Franchises)
9. InterContinental Hotels and Resorts (Hotel Franchises)
10. SUBWAY® (Sandwich & Bagel Franchises)
11. Baskin-Robbins (Ice Cream Franchises)
12. Domino's Pizza (Pizza Franchises)
13. Taco Bell (Fast Food Franchises)
14. Ace Hardware Corporation (Home Improvement Retail Franchises)
15. Jani-King Commercial Cleaning Services (Commercial Cleaning Franchises)
16. Wyndham Hotels and Resorts (Hotel Franchises)
17. Hertz (Car Rental & Dealer Franchises)
18. Carrefour (Convenience Store Franchises)
19. Europcar (Car Rental & Dealer Franchises)
20. Choice Hotels (Hotel Franchises)

THANK YOU FOR YOUR ATTENTION!

Engineering Management BMEVITMMB03

BME Faculty of Electrical Engineering and Informatics MSc EE and IT Majors

Economic & human themes

MANAGEMENT IN PRACTICE
Managerial style and culture

Zsuzsanna Kósa PhD

Prof. Gyula Sallai DSc

BME Dept. Telecommunications and Media Informatics

Budapest, spring of 2018

PROCESS OF BECOMING LEADER

Becoming leader - a possible process of the deployment of personality evolution

It needs:

- Professional knowledge, capability
  to have a grip on the situation, stress the essence
- Self-confidence, persistence, stress tolerance,
  self-knowledge,
- Opportunity, recognized chance
- Trust, tolerance, patience

Evolution phases:

- Valuable team member, responsible for theme
- Project manager, coordinator
- Permanent line manager at lower or middle level
- Middle manager, at functional or business area
- Top manager, head of business unit

MANAGERIAL CAPABILITIES

Capability to find the essence on his/her professional area

- Professional competence on one area, but may not have on each field
- Capable to learn unknown areas, apply analogies

Communication capability

- Formulate , allocate and control tasks
- Put good questions to other professionals and understand the answers

Capability to make decision and take responsibility

- If necessary, decide immediately, with responsibility in the lack of information
- Take responsibility for the decision later

Self-obligation to work, shared attention

- Make others to work, having a self-obligation of being involved and working
- Have attention on more persons and topics paralelly

Initiative, creativity, intuition, empathy

- Be patient, think of the situation of others,
- Undertake the unusual new one, listen to your anticipation (internal voice)

PROFESSIONAL COMPETENCE

Competence is capability to do something,
scope, authority, and professional knowledge with responsibility

Definition [by Karl-Erik Sveiby]: **Competence is a personal resource, formed as a results of learning and experiences, which makes it possible constructive and successful application of the obtained knowledge.**

Components of individual competence: *on an defined area*

- *Have explicit knowledge*
  ability to know, transmit and deepen knowledge, facts;
- *Try to achieve perfection in practice*
  having experiences and ability for judgment;
- *Being embedded*
  at national-, international-, professional and societal level.

Organizational competence is the sum of competences of members, if they achieve the of critical minimum mass.

MANAGERIAL CULTURE

The set of routines, customs, values, expectations relating to the leadership in an organisation:

- Expected attitude influences the manager's behaviour
- Power distance between the managers and subordinates
- Power distance between the managers of different level
- Communication rules in the management
- How to become leader
- Tolerance to mistake, using penalties in the management
- Acceptance of the disagreements, tolerance in the management

It dependends on history of the organization, and it is influenced by:

- economic environment and the industry
- national business culture,
- owner's, multinational business culture.

***Hofstede* determined dimensions of organisational and national culture.**

Examples: military, government, company, SME, R&D institute, university organisations are different

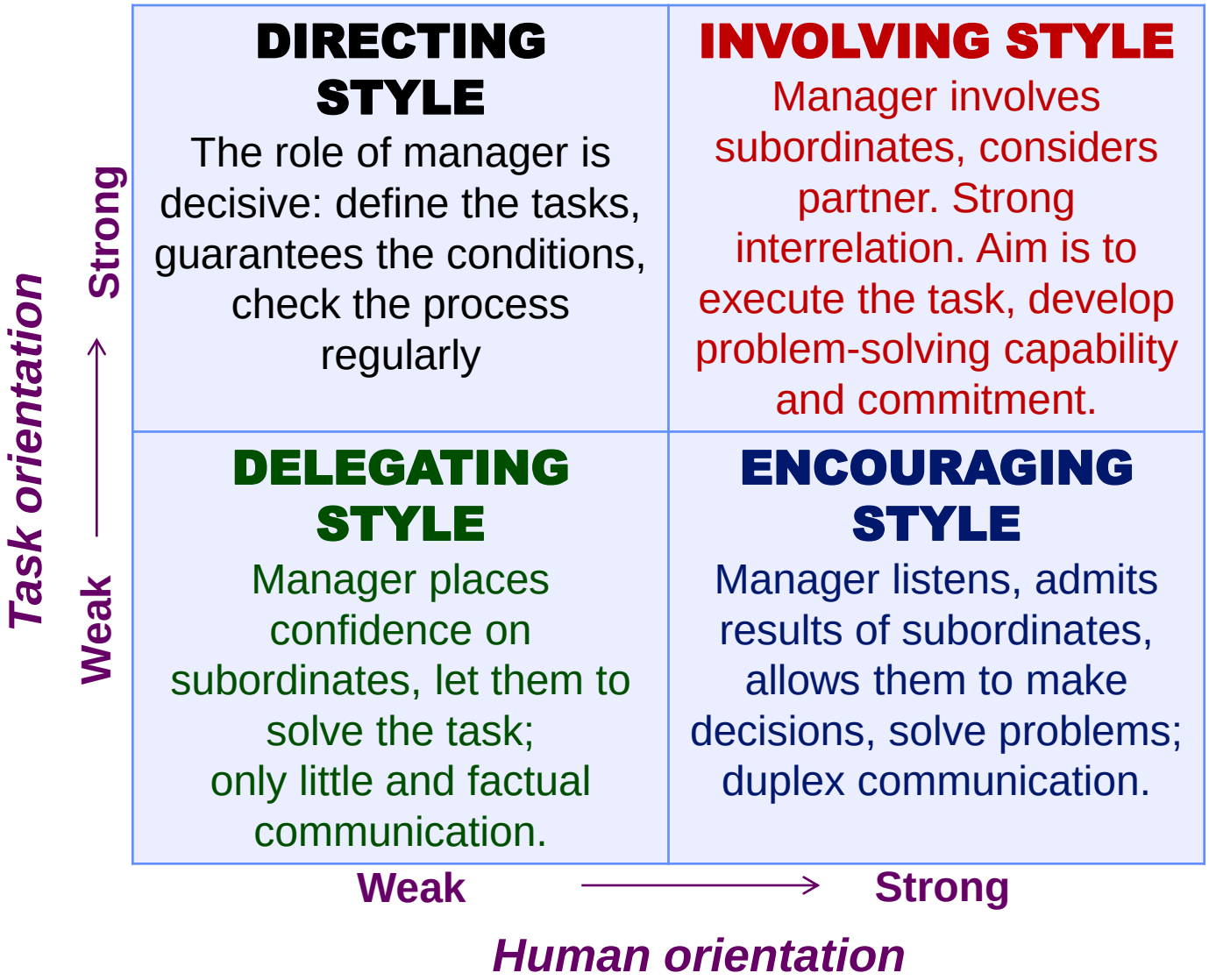
Changing culture: monopoly –> competition
technology orientation –> customer orientation
national firm –> part of a multinational firm

MANAGERIAL STYLES

Generic tasks and classical types

THEORETICAL TYPES	Characteristics	PRACTICAL TYPES
Autocratic	Honour, distance, experience; mostly exclusive decision and preparation written records, rigid deadlines, commands, information-portioning	**Dictatoric**
		Formal
		Authoritarian
Democratic	Peer-to-peer , community norms, striving after consensus, flexibility, compromise searching, verbalism and short notes, information-sharing	**Harmonic**
		Consultative
		Integrative
Liberal	Looking after, frame conditions, individual info', situation recognition, informal leaders and decisions, verbalism, intuition, creativity, variability	**Anarchic**
		Permissive
		Motivating

Dimensions of MANAGERIAL STYLES



Which MANAGERIAL STYLE IS EFFECTIVE?

Effective managerial style **depends on the *situation* and *persons***
there is no best style in absolute terms!

- *In the relation to task and human orientation* combinations of the four basic styles should be applied;
- the goal is, that the result and the atmosphere were optimal in the group or to a subordinate. (satisfaction maximizing)

Why do not we always apply the involving style ?

- *In generic managerial situations*: respect, carism is needed (lift the flag & show the way)
- Integrative style: everybody feels his/her contribution to the decision, nevertheless progressive
- Dictatoric style is good in crisis, critical execution.

Motivating manager, drawing attention — *Sparkling, easy-going manager*

Further reading
https://culcessieng.wordpress.com/2015/03/29/most-effective-leadership-and-management-styles-and-approaches/

How to MOTIVATE PERSONS

The **aim of motivating** is to build up cooperation within the team, achieve joint results, and make staff perform his/her task well:

- motivation is always individual, therefore it should be unique
- motivation tool depends on personality and age of the staff
- „Optimal job", where capabilities can be deployed

http://career-intelligence.com/art-motivation-workplace/

Staff may and will use his/her **negotiation position**:

- persons have ambition, desire recognition of their effort and results
- withhold a part of their capacity (for any other purposes, like hobby, family, learning, regeneration)
- influence indirectly or informally the environment (social leaders)

Self motivation: „What is the point of my job?"

- Good answer for this question leads to motivation
- It can be helped by information, *but we must find it ourselves*
- Everybody wants to achieve internal balance, harmony and intelligence.

Contribution of motivation tools to successfulness

SUCCESS-FULNESS	Effectiveness	Efficiency
Short time	**P** Harmony of performance requirement and income	**A** HR support systems (incentives, job descriptions)
Long time	**E** Motivating environ (work conditions, tasks, reward, carrier chances...)	**I** Integrating objectives (cust'r, owner, employee), organizational culture, consistency

Read more http://paei.wikidot.com/adizes-methodology

PROBLEM SOLVING, DECISION

Capability to change viewpoint (lateral thinking):

- ❖ New possibilities, solutions, deviate from routin,
- ❖ Some kind of essential simplification – in order to negotiate

To consider problem or crisis as a challenge, a chance, and not as a threat: *„Make benefit from problem”*

- ➢ accept , that we must change, but then it should have a well selected target.
- ➢ understand the situation, increase consciousness,
- ➢ achieve a constructive resolution of conflict: find strength, do not see only weakness and threats.

Look for „win-win” solutions, avoid to make a wound:

- ✓ harmony of competition and collaboration
- ✓ synergy of optimal compromise

Preserve your internal priority and integrity:

- ◆ You should recognize, what is allowed by your soul

https://limitlesslives.org/2015/03/24/think-win-win/

MANAGERS AMONG THEMSELVES

Hierarchical relations

- Directing, vs. reporting relationships
- Among the upper, middle and lower managerial levels

Horizontal relations

- Cooperation built in the processes or ad-hoc common works based on goals

Committees, bodies

- Forums of collective decision making and information collection

Teams, projects

- Collective creation processes: strategy, concept, development

Informal nets

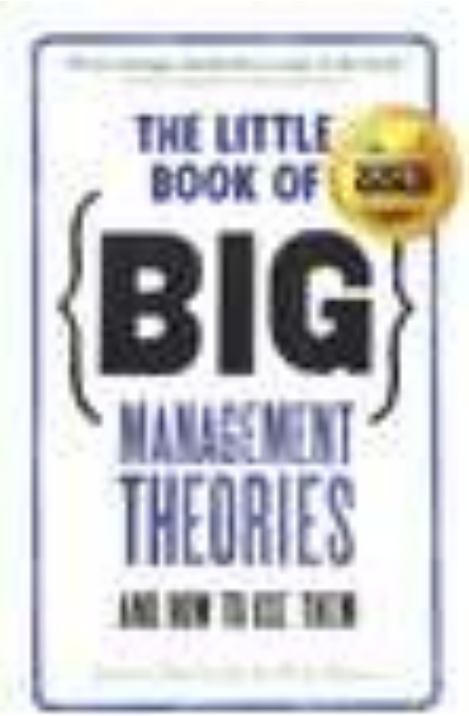
- Information exchange and mutual favours
- Alliances, loose nets, clans

Internal lobby

- Convince internal decision makers in advance
- Imagine alternatives and their evaluation built on empathy (What could be the benefit for him/her ?).

Books on the topic

Scott Berkun: Making Things Happen: Mastering Project Management (Theory in Practice) 2008
http://www.amazon.com/Making-Things-Happen-Mastering-Management/dp/0596517718%3FSubscriptionId%3DAKIAILSHYYTFIVPWUY6Q%26tag%3Dduckduckgo-d-20%26linkCode%3Dxm2%26camp%3D2025%26creative%3D165953%26creativeASIN%3D0596517718



Jim McGrath, Bob Bates: The Little Book of Big Management Theories
... and how to use them
http://www.pearsoned.co.uk/bookshop/detail.asp?item=100000000515498

Engineering Management BMEVITMMB03
BME Faculty of EE & IT MSc Majors
Economic & Human Themes

INNOVATION MANAGEMENT

István Gódor PhD & prof. Imre Abos

BME Dept. Telecommunications and Media Informatics

Budapest, Spring of 2018

Content

- Introduction
- What is innovation?
- Innovation chains and models
- R&D in countries of OECD (Organization for Economic Co-operation and Development)
- EU and European Institute of Innovation and Technology (EIT)
- EU and Horizon 2020
- Information and Communication Technologies Work Programme
- Hungary

INTRODUCTION

Tasks of innovation

Effect of innovation

Waves of technology development

Global tasks of innovation

Examples from multiple domains

Source: Pixabay

- Prevention and treatment of **dangerous diseases**
- Replacing traditional raw materials which are **scarce resources or dangerous** for health
- Decreasing carbon dioxide (CO_2) **emission**, handling **glasshouse** effect and ozone shield damages
- Research and development of new technologies and methods for **energy supply** and energy **saving**
- Decreasing the environment **pollution** and dangerous effects for the environment
- Novel methods to meet the requirements of **healthy nutrition**

Source: Flickr

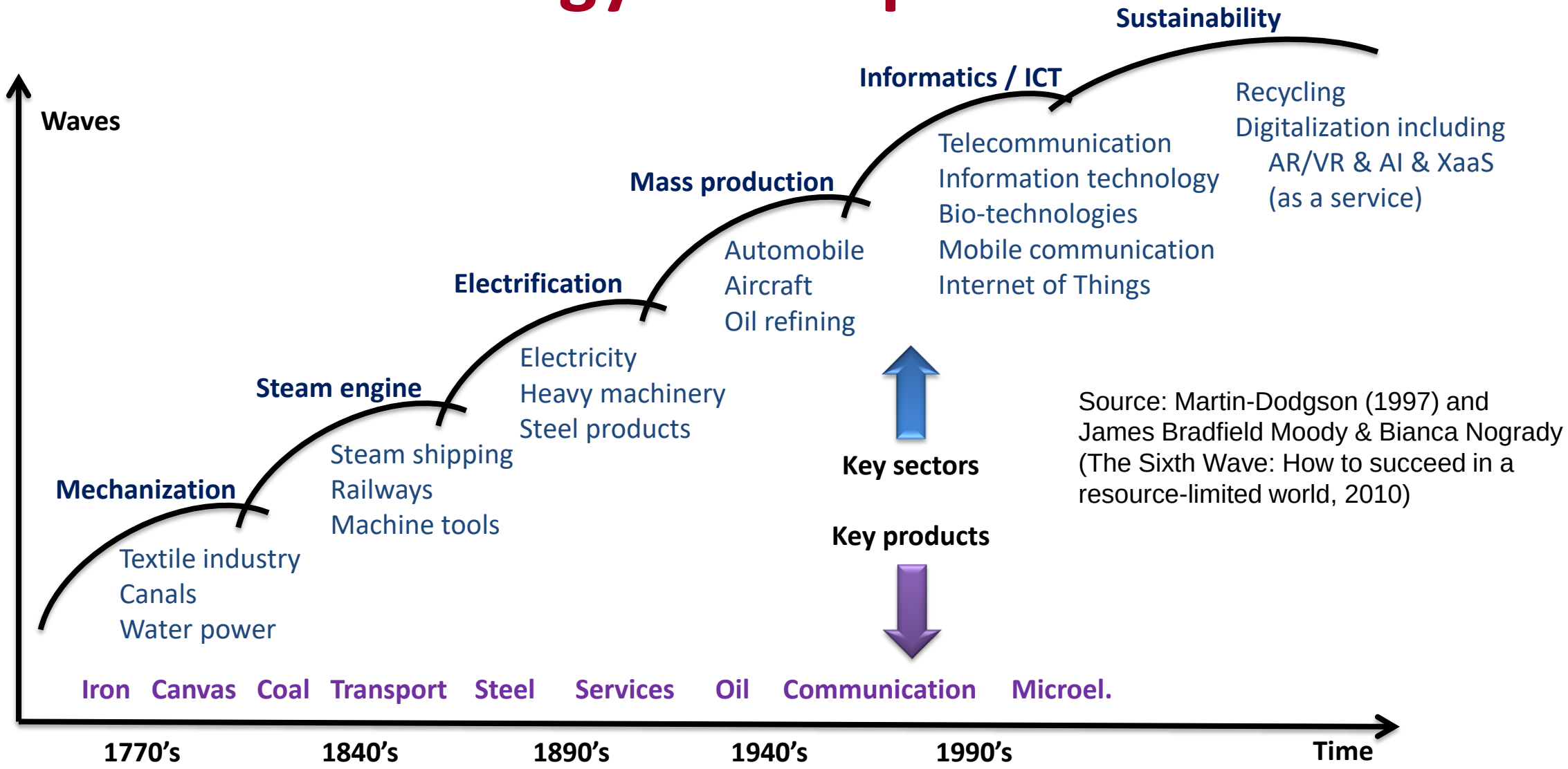
Source: Wikipedia

Effect of innovation

In point of view of the mankind

- Innovation promotes the **development of the mankind**
- Economists agree, that nowadays innovation has been the most important **engine of economic development**
- The world is moved along interests, but only the **science and the innovation takes it forward**
- Innovation has become the **main source of the competitiveness** of enterprises and the dynamism of the national economies
- Innovation **enhances the quality of human life** in case of any type of demand

Waves of technology development



Source: Martin-Dodgson (1997) and James Bradfield Moody & Bianca Nogrady (The Sixth Wave: How to succeed in a resource-limited world, 2010)

WHAT IS INNOVATION?

Concept & Basic types

Information sources

Motivating factors

Innovation system & Innovative companies

Innovation concept

- With respect to the Oslo Manual **innovation activities** are:
  - „all scientific, technological, organizational, financial and commercial steps which actually help or lead to the implementation of innovations."

- „**Innovation: implementation** of
  - a new or significantly improved product (good or service) or
  - process,
  - a new marketing method, or
  - a new organizational method"

Source: OECD, Oslo Manual, 2005

Basic types of innovation

Types of innovation

- Product innovation
- Service innovation
- Process innovation
- Organizational innovation
- Management innovation
- Marketing innovation

Examples

- New or enhanced product
- New service concept
- New or enhanced process
- New organizational structure
- New management practice: TQM, BPR*
- New marketing practice, new sales concept, new way of financing

* TQM: Total Quality Management

BPR: Business Process Reengineering

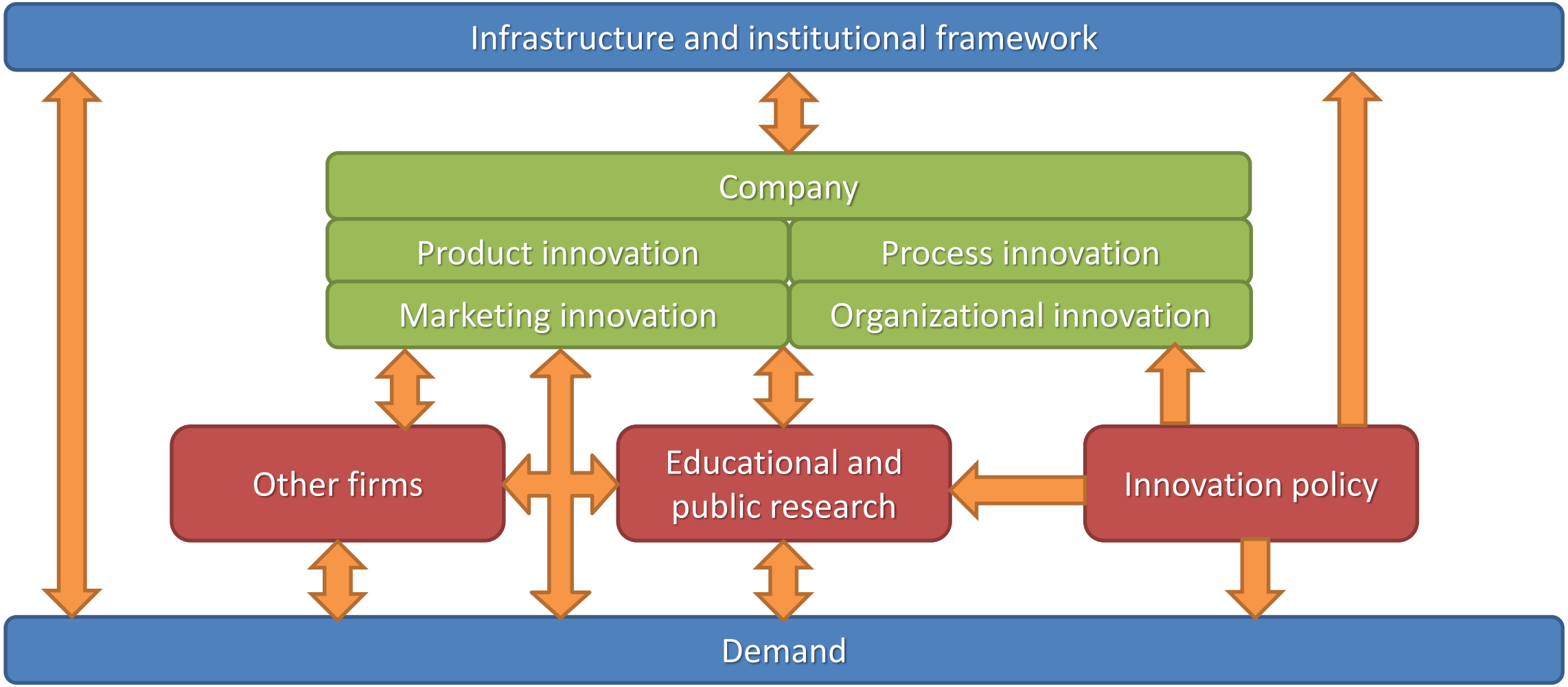
Information sources of innovation

- **Open information sources**
  - Openly available information that does not require the purchase of technology or intellectual property rights, or interaction with the source
- **Acquisition of knowledge and technology**
  - Purchases of external knowledge and/or knowledge and technology embodied in capital goods (machinery, equipment, software) and services, which does not involve interaction with the source
- **Innovation co-operation**
  - Active co-operation with other enterprises or public research institutions for innovation activities (which may include purchases of knowledge/technology)

Factors motivating innovation

- **Solvent demands** for novelties (products and services)
- Collecting more **profit by innovation**
- **Birth of new scientific results**
- **New successes** of the competitors on the market
- **Technical and financial obsolescence** of products and services
- **EU or national** research & development **support** opportunities

Innovation system



Innovative company

- Its innovative **ability is high**, innovative **ambition is strong**
- Its management and operation show an **innovation oriented approach**
- In order to create and preserve competitiveness the **modernization tasks are specified and then performed**
- Innovations are introduced, accomplished
- **A company is innovative, if**
  - in the period under review (1-3 years) it has successfully introduced at least one product or technological innovation (Oslo Manual); or
  - more than 20% of its revenue arises from the product innovations introduced in the previous three years.

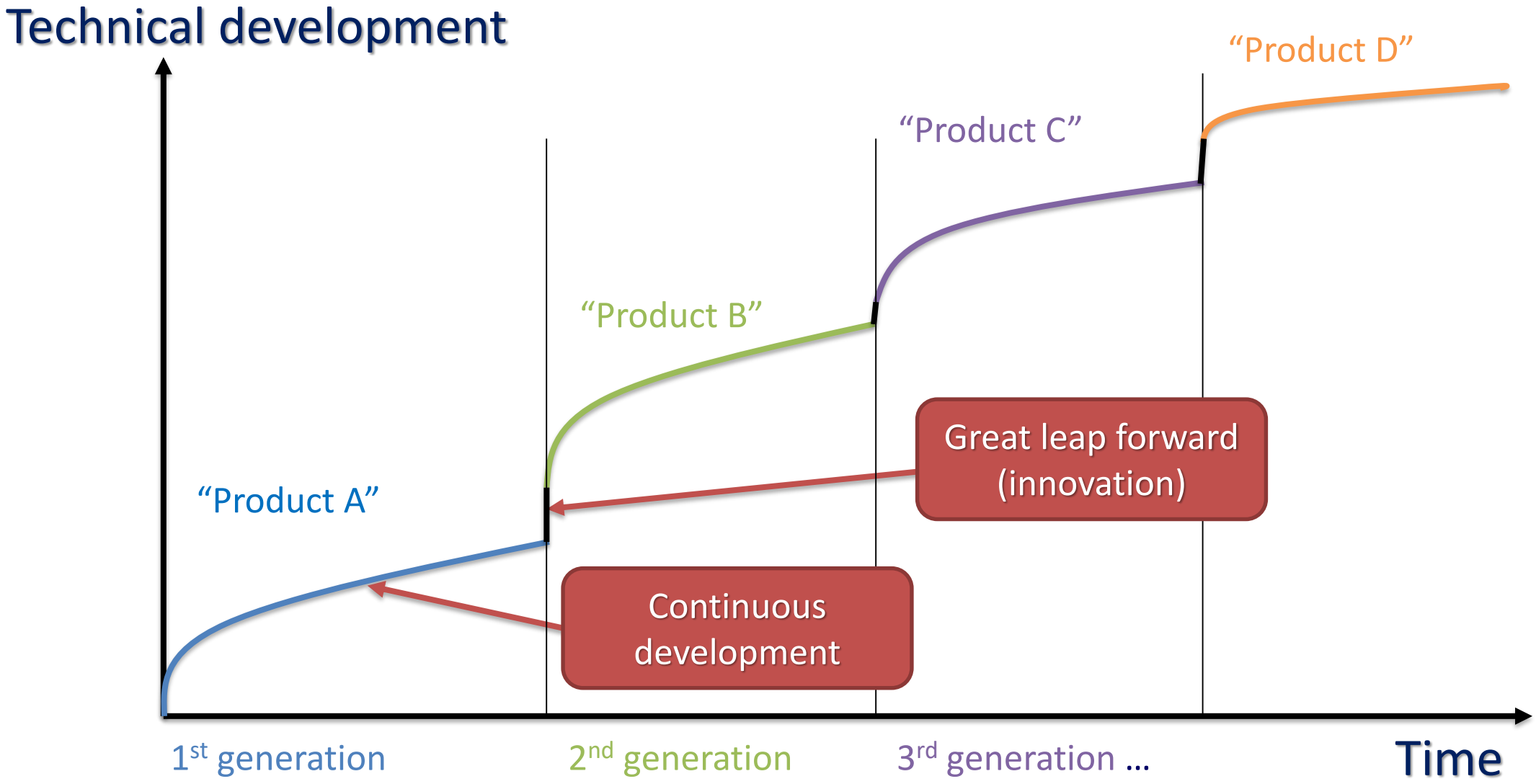
INNOVATION CHAINS AND MODELS

Phases of technical development

Open and closed innovation chains

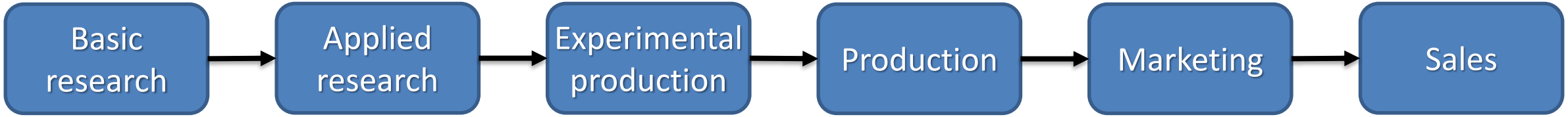
Complex model of innovation

Phases of technical development



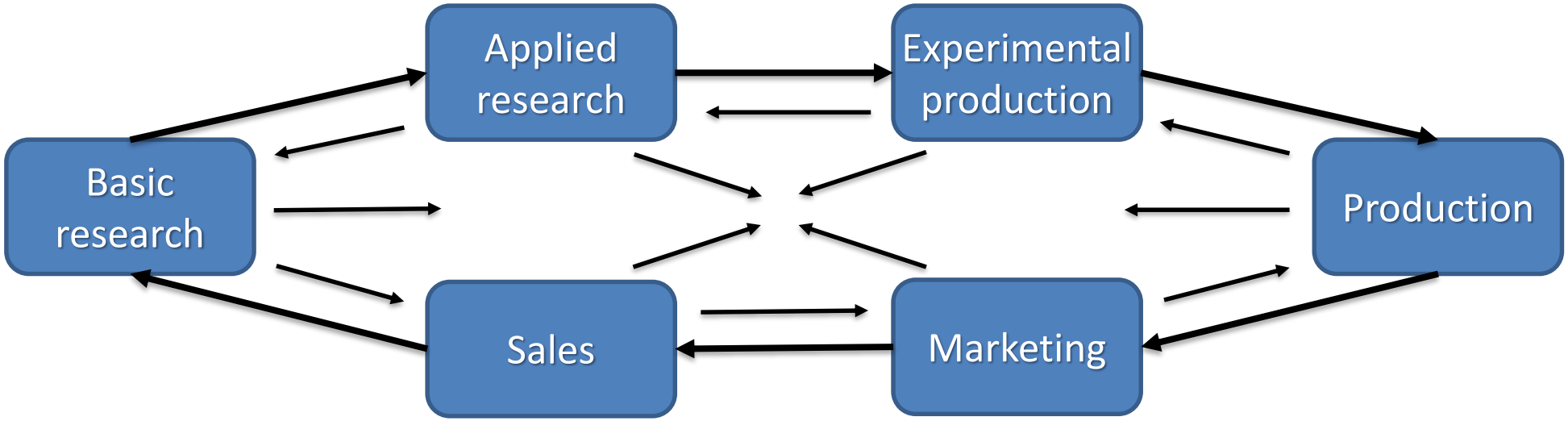
Innovation chain 1/2

- Open innovation chain (old model)
  - An innovation arises and acts with respect to the scheme of the so-called linear model
  - The innovation is born in the research laboratories
  - The innovation is realized along the phases of ”basic research - applied research - experimental production - production - marketing - sales”



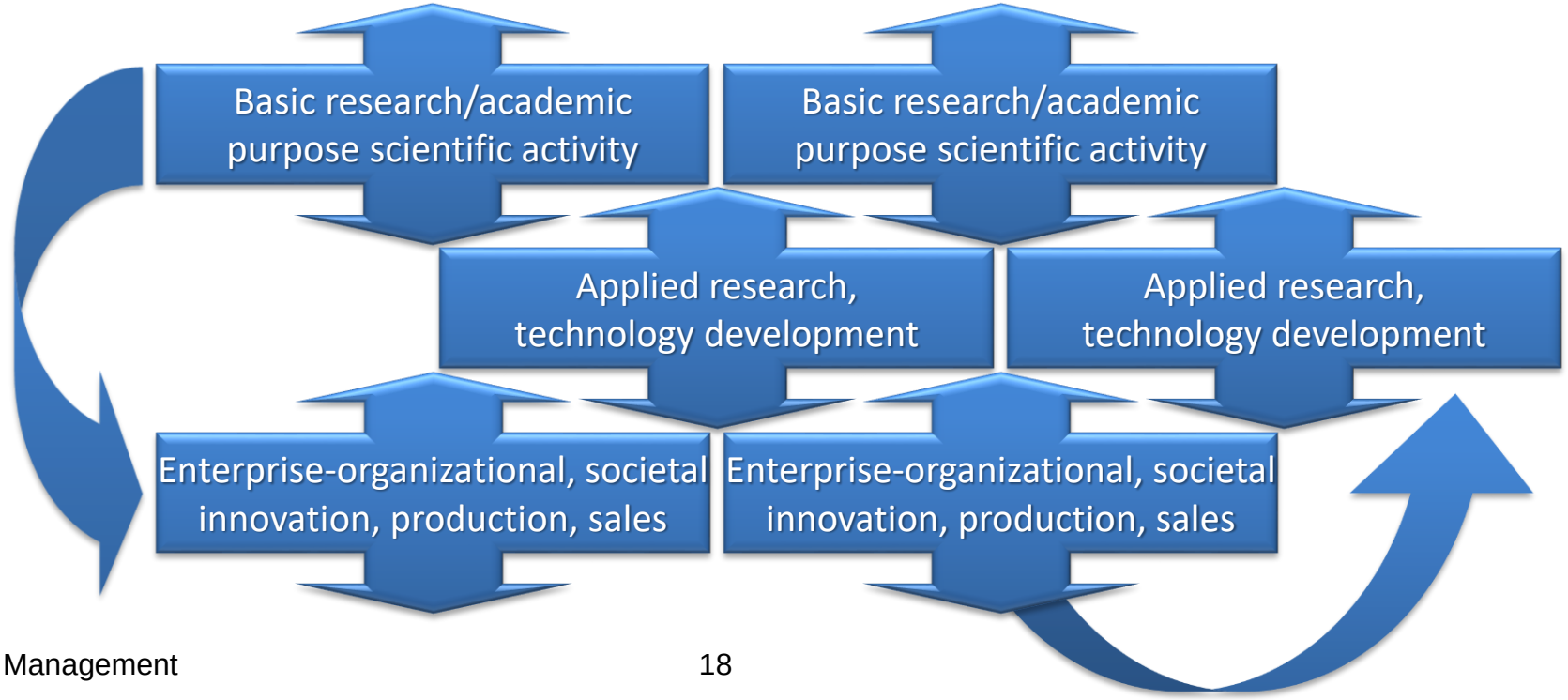
Innovation chain 2/2

- Closed innovation chain (newer model)
  - The product ideas are born for the market and other effects
  - Product plans are shaped with respect to market requirements
  - Testing the experimental production happens on the market from the very beginning
  - The experiences are feed-backed to the research and development



Complex model of innovation

- The different activities are performed in more areas in parallel
- The activities interact with each other
- There are feedbacks among the processes



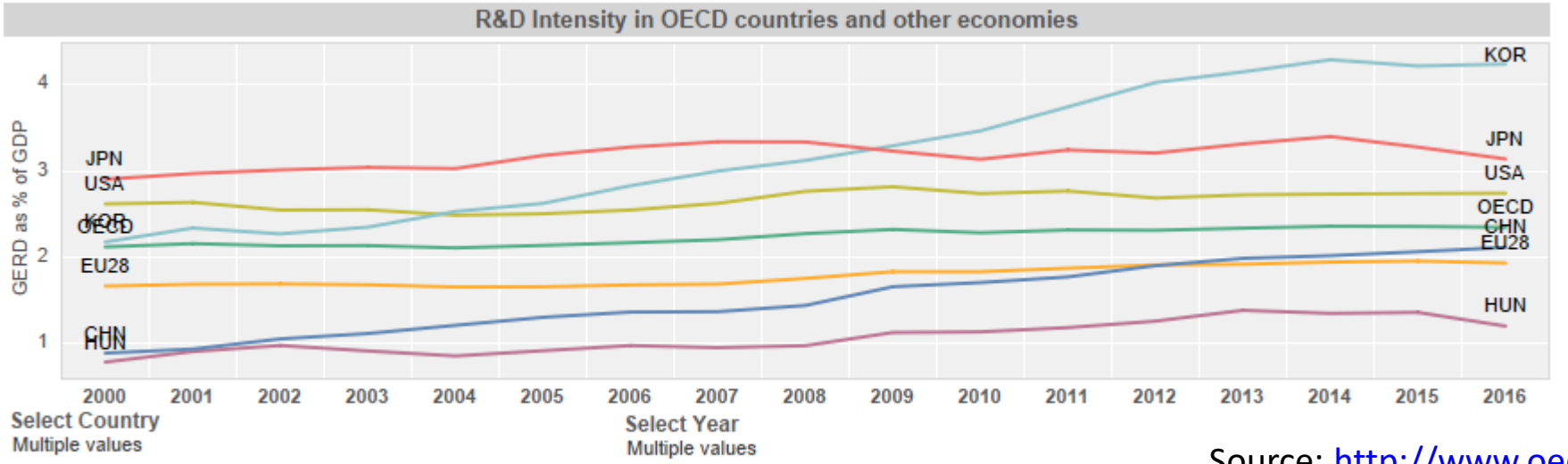
OECD COUNTRIES AND R&D

Expenditures on R&D in OECD countries (Organization for Economic Co-operation and Development)

Gross Domestic Expenditures on R&D

R&D intensity as a percentage of Gross Domestic Product (GDP)

- Israel and Korea still have the highest at 4.25% and 4.24%
- Japan declined to 3.1%
- US stable at 2.7%
- OECD countries stable at 2.4%
- EU fell slightly to 1.94%
- China stable at 2.12%
- Hungary is about 1.2%



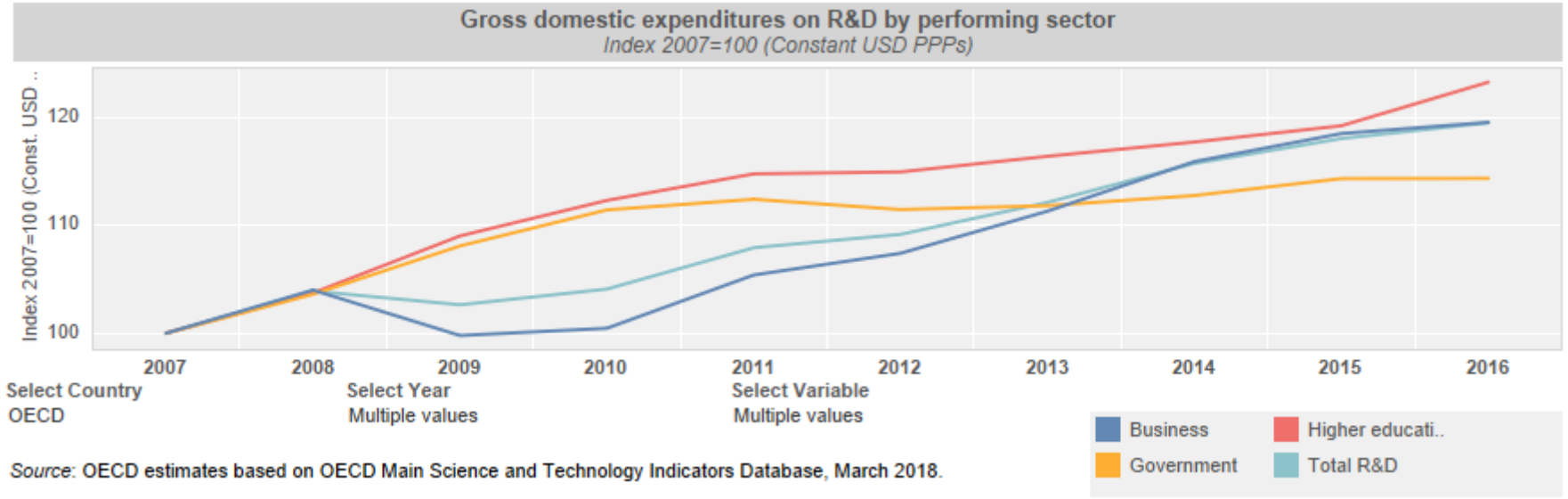
Source: http://www.oecd.org/sti/msti.htm

Source: OECD estimates based on OECD Main Science and Technology Indicators Database, March 2018.

Gross Domestic Expenditures on R&D (1/2)

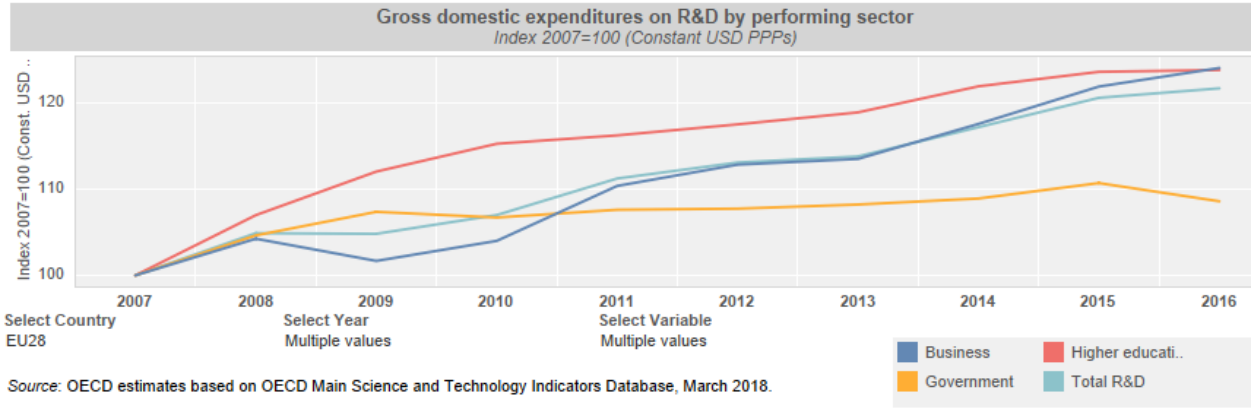
By performing sector

- Across OECD countries, real expenditure on R&D grew by 1.2% in 2016
- Business enterprises, which undertook 69% of total R&D in the OECD saw lower growth of 0.9%
- Government R&D plateaued, but higher education increased by 3.4%

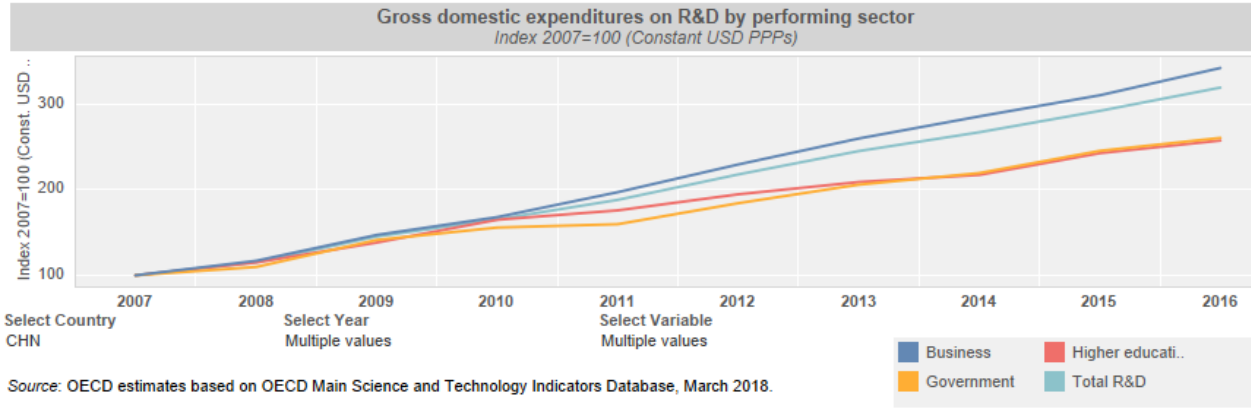


Gross Domestic Expenditures on R&D (2/2)

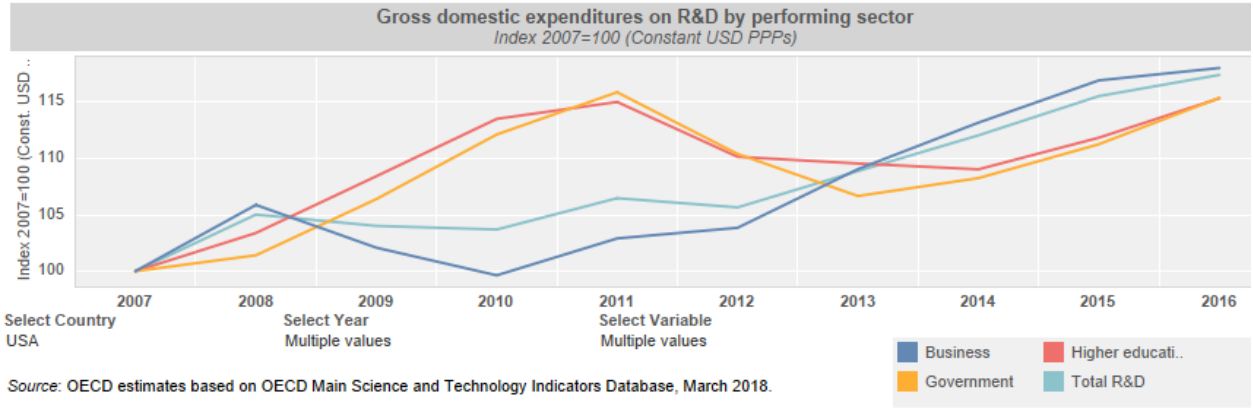
By performing sector



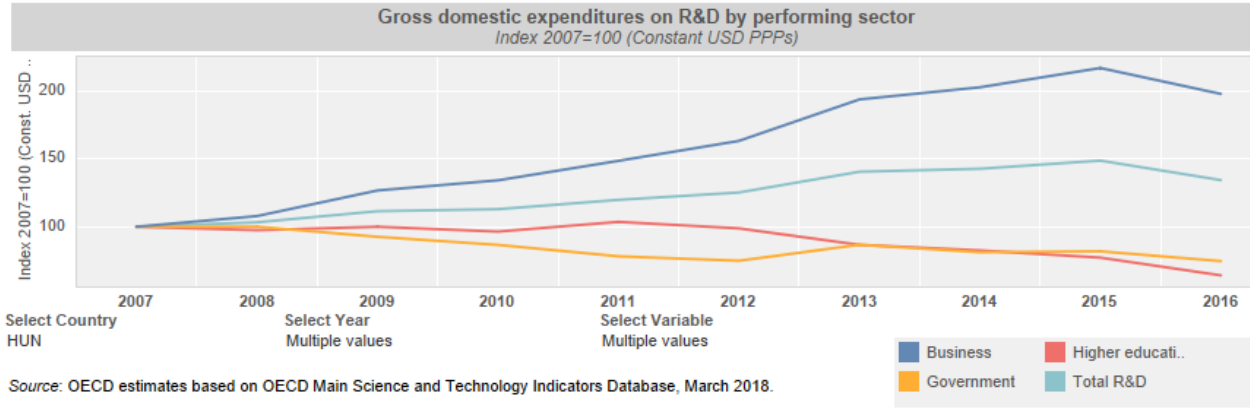
EU28



China



USA



Hungary

Source: http://www.oecd.org/sti/msti.htm

EUROPEAN UNION AND EIT

EU position on innovation

European Institute of Innovation and Technology (EIT)

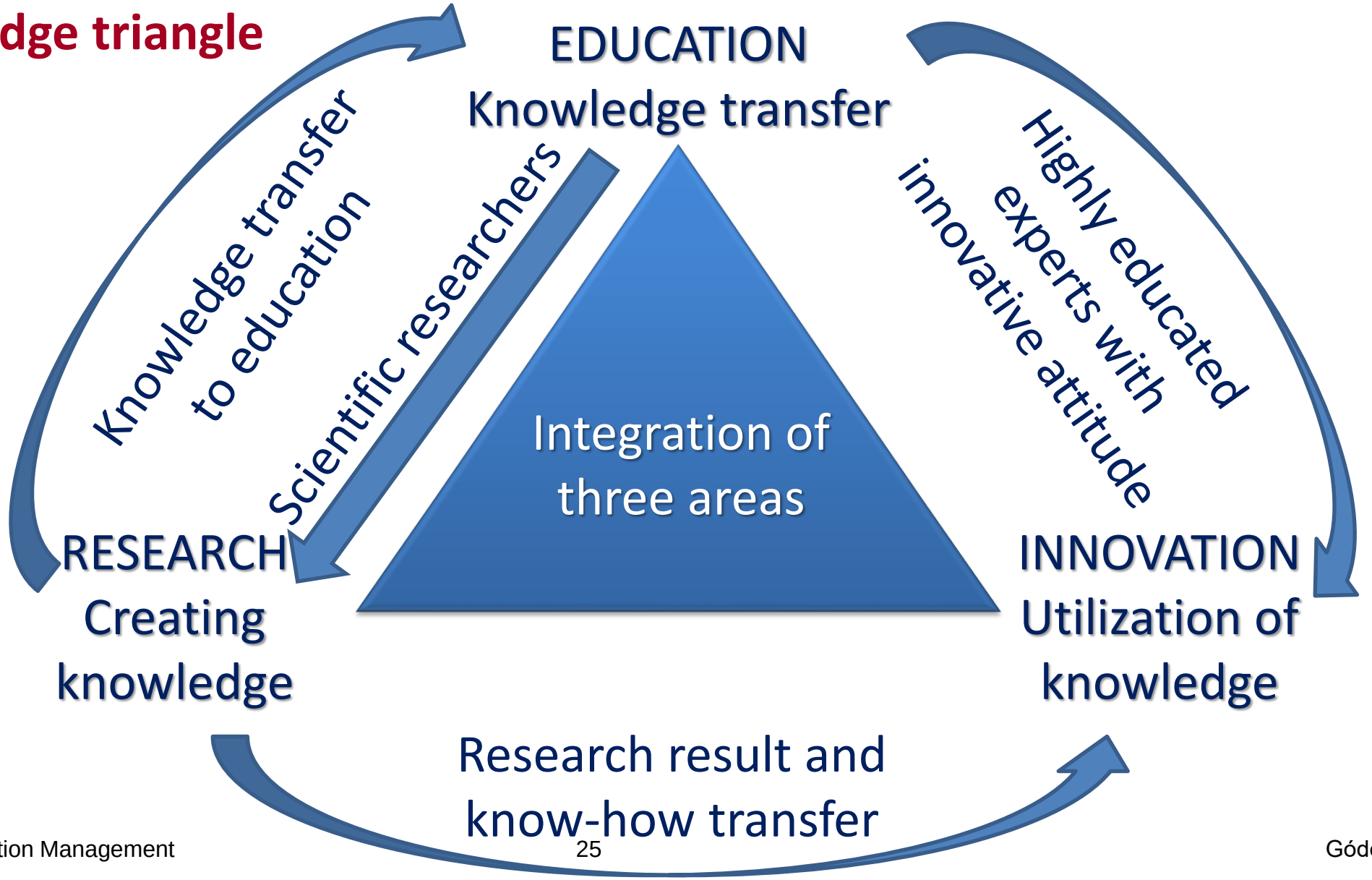
EU position on innovation (1/2)

Brief highlights

- The basic development factors of the knowledge based society and economy are: **education, research and innovation** and their synergies
  → Europe should create **integrated knowledge triangle**
- Strengthening **cooperation and synergies** is important
  - To enhance competitiveness of the industrial and service sectors in the EU
  - To create new jobs and sustainable growth
- Most member states have difficulties
  - Not enough **innovative attitude**
  - **Critical mass** of human and financial resources are needed
  - The **best scientific researchers** must be attracted

EU position on innovation (2/2)

Knowledge triangle



European Institute of Innovation and Technology (EIT) 1/2

- EIT is a new independent EU body which was set up in 2008 to address Europe's innovation gap with a positive impact on economy and society
- The **mission** of the EIT is to grow and capitalize on innovation capacity and capability of actors from higher education, research, business and entrepreneurship from the EU and beyond through the creation of highly integrated **Knowledge and Innovation Communities (KICs)**
- Recent KICs are
  - Climate-KIC (Climate change mitigation and adaptation)
  - KIC InnoEnergy (Sustainable energy)
  - EIT Digital (former EIT ICT Labs for Future information and communication society)

European Institute of Innovation and Technology (EIT) 2/2

- **EIT Digital** (Future information and communication society)
  - Nodes: Stockholm, Helsinki, Berlin, Paris, Eindhoven
  - Associate nodes: Trento, London, Budapest

- **EIT Digital Budapest Associate Partner Group** is
  - Consortium of Eötvös Loránd University (ELTE) and Budapest University of Technology and Economics (BME) and their leading industrial partners
  - Consortial partners: Ericsson Hungary, Magyar Telekom; cooperating partners: Cisco Systems Hungary, Nokia Solutions and Networks, and General Electric Healthcare

EIT Digital innovation areas

- **Cyber-Physical Systems**: European leadership in production and infrastructures
- **Future Cloud**: A secure data and service infrastructure for Europe
- **Future Networking Solutions**: Building Europe's communication infrastructure of tomorrow
- **Health & Wellbeing**: Prevention through the quantified self
- **Privacy, Security & Trust**: A protected blended life
- **Smart Energy Systems**: Defining Europe's future energy market
- **Smart Spaces**: Blending the physical world and the virtual world
- **Urban Life and Mobility**: Informed citizens and revolutionized urban mobility

Source: http://budapestictnetwork.elte.hu/eit-digitals-innovation-areas/

EIT Digital education programs

- **Master school** with technical majors in Budapest
  - Software and Service Architectures (SSA) at ELTE
  - Security and Privacy (S&P) at ELTE
  - Digital Media Technology (DMT) at BME
  - Embedded Systems (ES) at BME – to be launched in 2016
- **Doctoral school** with excellence in communication software and system performance including established a active cooperation with partners
  - Ericsson Hungary
  - Cisco Systems Hungary
  - Nokia Solutions and Networks
  - Magyar Telekom
  - ELTE-Soft

Source: http://budapestictnetwork.elte.hu/education/

EUROPEAN UNION AND HORIZON 2020

Priorities

Budget

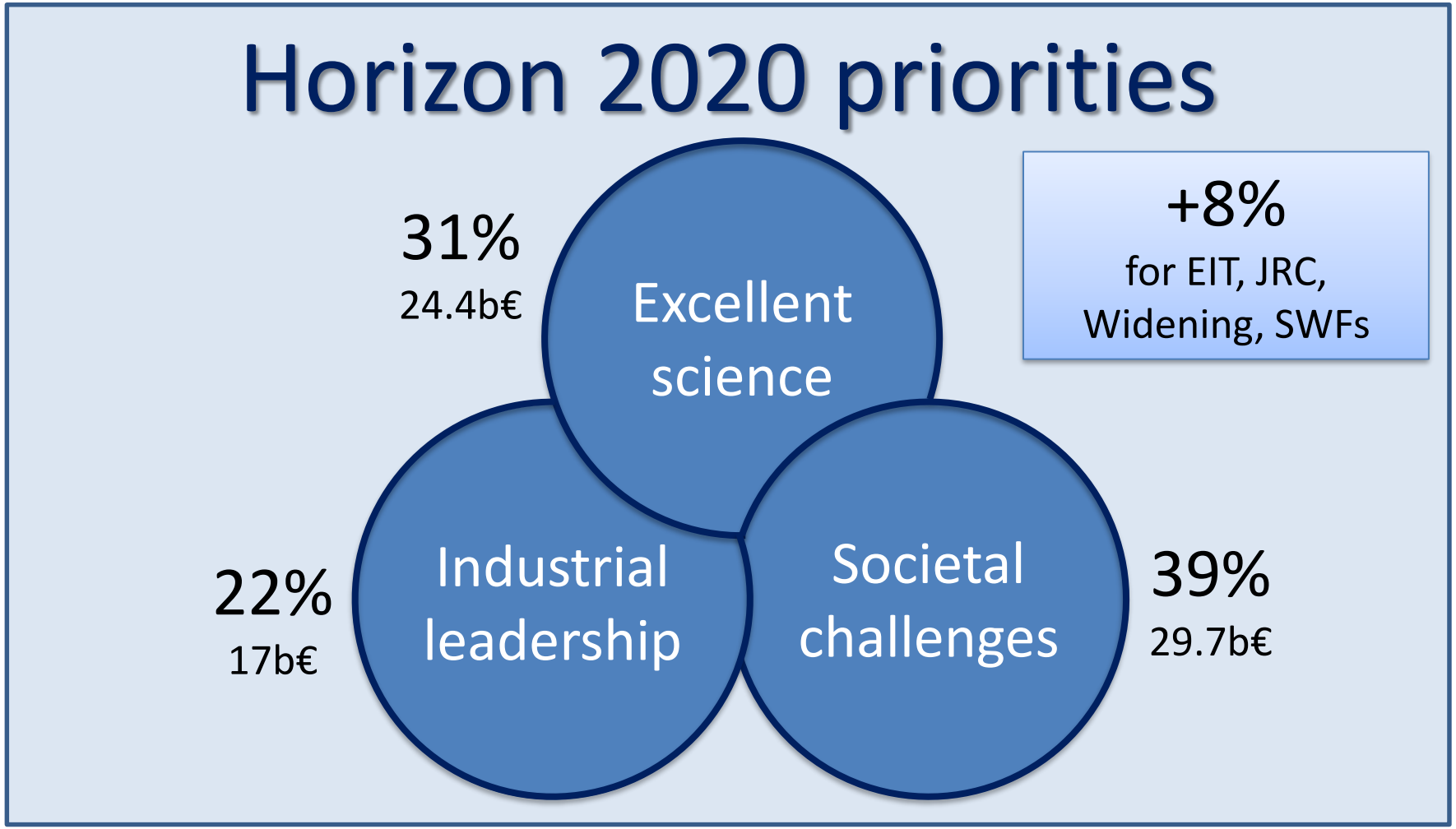
Position of ICT

Overview

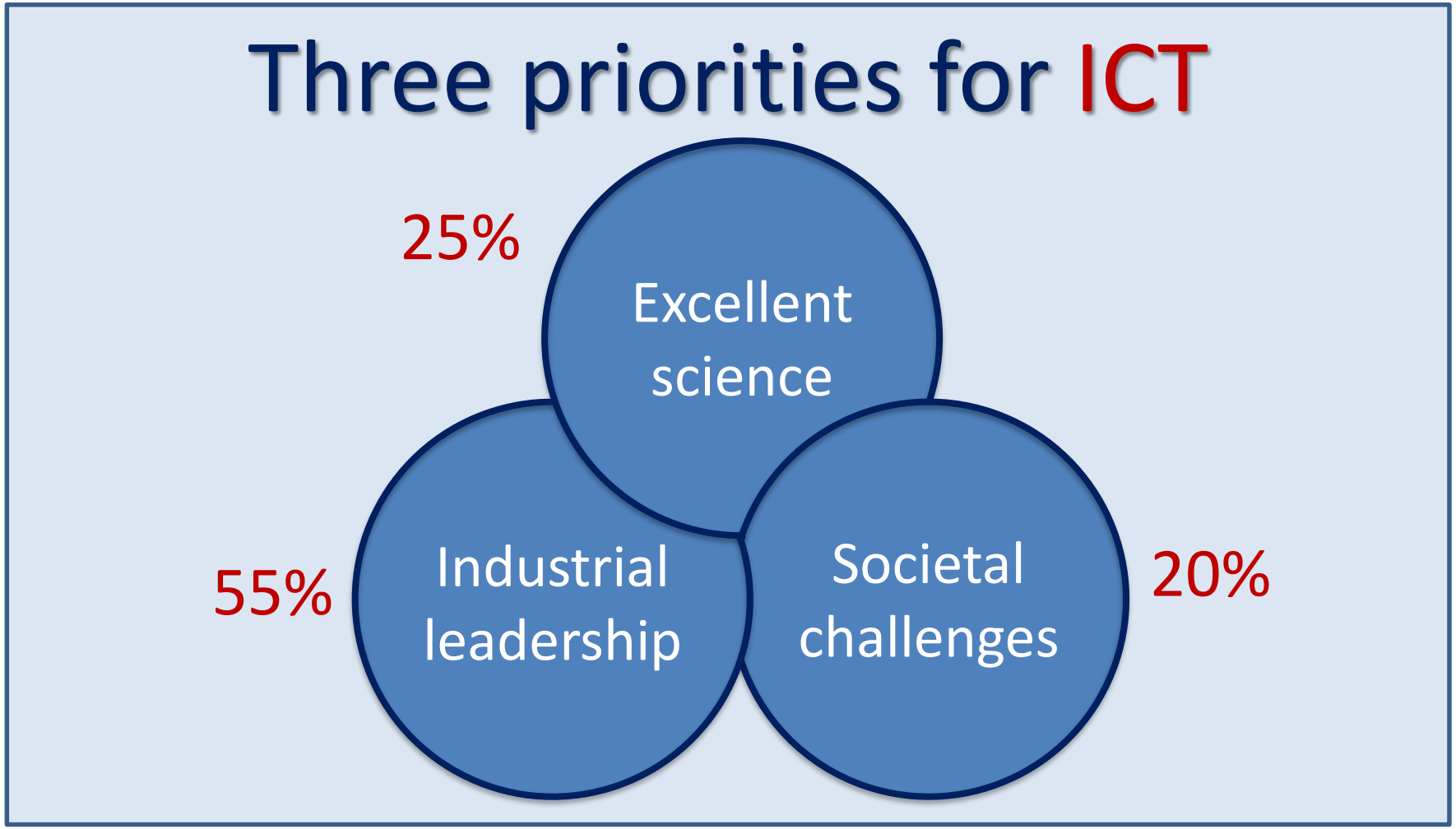
EIT: European Institute of Innovation and Technology
JRC: Joint Research Centre
SWFs: Sovereign Wealth Funds

Priorities and budget

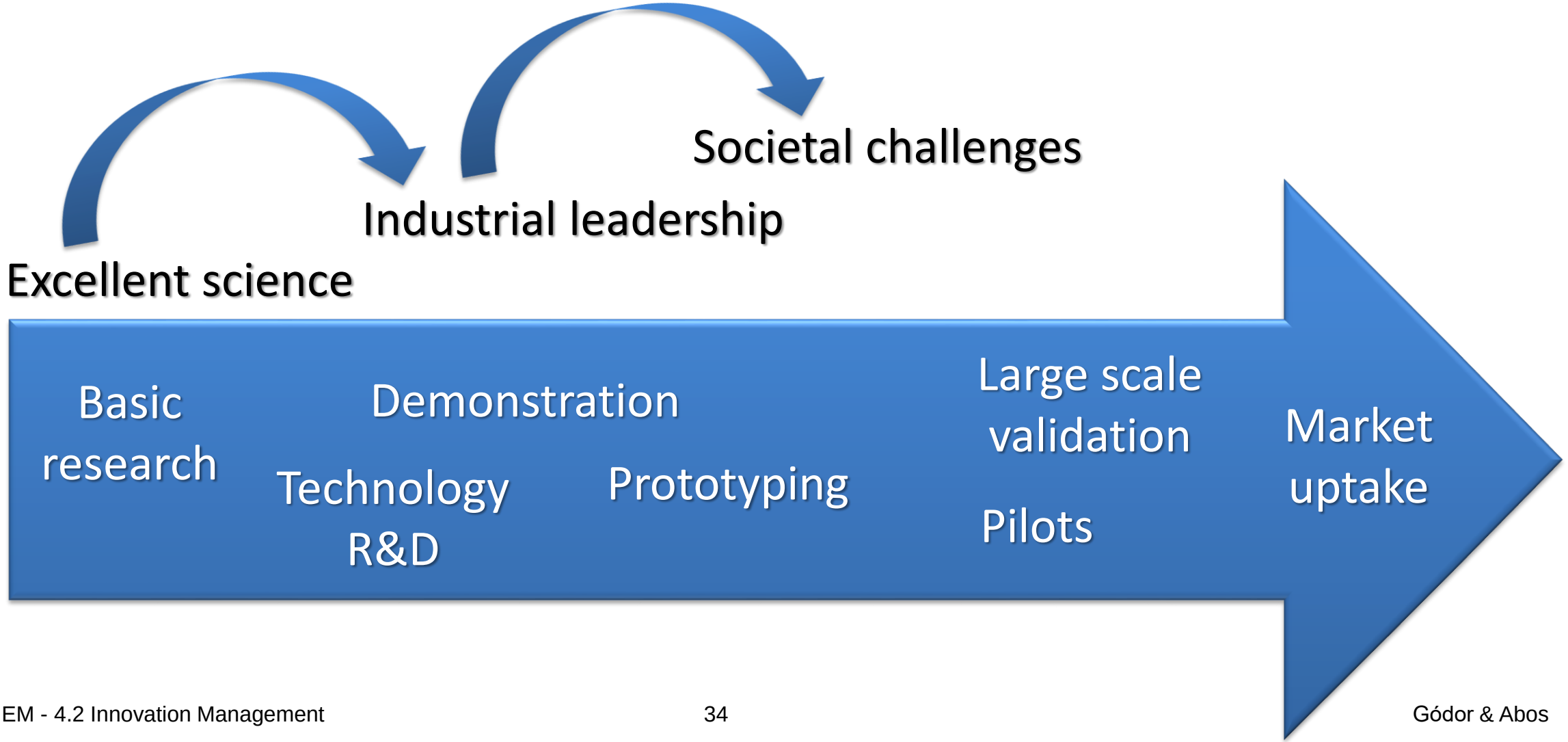
EIT: European Institute of Innovation and Technology
JRC: Joint Research Centre
SWFs: Sovereign Wealth Funds



ICT priorities



Coverage of the full innovation chain



ICT in Excellent science

- **Future and Emerging Technologies (FET)**
  - FET Open: fostering novel ideas
  - FET Proactive: nurturing emerging themes and communities
  - FET Flagships: pursuing grand interdisciplinary science and technology challenges
- **Research infrastructures**
  - Developing the European research infrastructure for 2020 and beyond
  - Development, deployment and operation of ICT-based e-infrastructures
  - ICT infrastructure resources and services for Research
  - Access to and management of scientific data
  - High Performance Computing

ICT in Industrial leadership

- **A new generation of components and systems**
  - Engineering of advanced embedded and resource efficient components and systems
- **Next generation computing**
  - Advanced and secure computing systems & technologies, including cloud computing
- **Future Internet**
  - Software, hardware, infrastructures, technologies and services
- **Content technologies and information management**
  - ICT for digital content, cultural and creative industries
- **Advanced interfaces and robots**
  - Robotics and smart spaces
- **Micro- and nanoelectronics and photonics**
  - Key enabling technologies

ICT in Societal challenges

- **Health**, demographic change and wellbeing
- **Food** security, sustainable agriculture, and forestry, marine, maritime and inland water research, and the bioeconomy
- Secure, clean and efficient **energy**
- Smart, green and integrated **transport**
- **Climate** action, environment, resource efficiency and raw materials
- **Europe** in a changing world – inclusive, innovative and reflective societies
- **Secure societies** – protecting freedom and security of Europe and its citizens

INFORMATION AND COMMUNICATION TECHNOLOGIES WORK PROGRAMME

Activities in 2014-2015 and 2016-2017

Future activity calls for 2018-2020

Source of chapter: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/information-and-communication-technologies

Activities in 2014-2015 and 2016-2017

- **Six main activity lines** have been identified in the ICT-LEIT (Leadership in Enabling and Industrial Technologies) part of the Work Programme:
  1. A new generation of components and systems
  2. Advanced Computing
  3. Future Internet
  4. Content technologies and information management
  5. Robotics
  6. Key enabling technologies (Micro- and nano-electronic technologies, Photonics)
- **Additional cross-cutting topics**: cyber-security, Internet of Things and research on a Human-centric Digital Age

1) A new generation of components and systems

- ICT-01-2014: Smart Cyber Physical Systems
- ICT-02-2014: Smart System Integration
- ICT-03-2014: Advanced Thin, Organic and Large Area Electronics (TOLAE) technologies

- ICT-01-2016: Smart Cyber Physical Systems
- ICT-02-2016: Thin, Organic and Large Area Electronics
- ICT-03-2016: SSI - Smart System Integration
- ICT-04-2017: Smart Anything Everywhere Initiative

2) Advanced Computing and Cloud Computing

- ICT-04-2015: Customized and low power computing

- ICT-05-2017: Customized and low energy computing (including Low power processor technologies)
- ICT-06-2016: **Cloud Computing**
- ICT-42-2017: Framework Partnership Agreement in European low-power microprocessor technologies

3) Future Internet (1/3)

- ICT-5-2014: Smart Networks and novel Internet Architectures
- ICT-6-2014: Smart optical and wireless network technologies
- ICT-7-2014: Advanced Cloud Infrastructures and Services
- ICT-8-2015: Boosting public sector productivity and innovation through cloud computing services
- ICT-9-2014: Tools and Methods for Software Development
- ICT-10-2015: Collective Awareness Platforms for Sustainability and Social Innovation
- ICT-11-2014: FIRE+ (Future Internet Research & Experimentation)

3) Future Internet (2/3)

- ICT-12-2015: Integrating experiments and facilities in FIRE+
- ICT-13-2014: Web Entrepreneurship
- ICT-14-2014: **Advanced 5G Network Infrastructure for the Future Internet**

- ICT-07-2017: **5G** PPP Research and Validation of critical technologies and systems
- ICT-08-2017: **5G** PPP Convergent Technologies
- ICT-09-2017: Networking research beyond **5G**

3) Future Internet (3/3)

- ICT-10-2016: Software Technologies
- ICT-11-2017: Collective Awareness Platforms for Sustainability and Social Innovation
- ICT-12-2016: Net Innovation Initiative
- ICT-13-2016: Future Internet Experimentation - Building a European experimental Infrastructure

4) Content technologies and information management (1/3)

- ICT-15-2014: **Big data and Open Data** Innovation and take-up
- ICT-16-2015: **Big data** - research
- ICT-17-2014: Cracking the language barrier
- ICT-18-2014: Support the growth of ICT-innovative Creative Industries SMEs
- ICT-19-2015: Technologies for creative industries, social media and convergence
- ICT-20-2015: Technologies for better human learning and teaching
- ICT-21-2014: Advanced digital gaming/gamification technologies
- ICT-22-2014: Multimodal and Natural computer interaction

4) Content technologies and information management (2/3)

- ICT-14-2016-2017: **Big Data** PPP: cross-sectorial and cross-lingual data integration and experimentation
- ICT-15-2016-2017: **Big Data** PPP: Large Scale Pilot actions in sectors best benefitting from data-driven innovation
- ICT-16-2017: **Big data** PPP: research addressing main technology challenges of the data economy
- ICT-17-2016-2017: **Big data** PPP: Support, industrial skills, benchmarking and evaluation
- ICT-18-2016: **Big data** PPP: privacy-preserving big data technologies

4) Content technologies and information management (3/3)

- ICT-19-2017: Media and content convergence
- ICT-20-2017: Tools for smart digital content in the creative industries
- ICT-21-2016: Support technology transfer to the creative industries
- ICT-22-2016: Technologies for Learning and Skills
- ICT-23-2017: Interfaces for accessibility
- ICT-24-2016: Gaming and gamification

5) Robotics and Autonomous Systems

- ICT-23-2014: Robotics 2014
- ICT-24-2015: Robotics 2015

- ICT-25-2016-2017: Advanced robot capabilities research and take-up
- ICT-26-2016: System abilities, development and pilot installations
- ICT-27-2017: System abilities, SME & benchmarking actions, safety certification
- ICT-28-2017: Robotics Competition, coordination and support

6) ICT Key Enabling Technologies

- ICT-25-2015: Generic micro- and nano-electronic technologies
- ICT-26-2014: Photonics KET 2014
- ICT-27-2015: Photonics KET 2015
- ICT-28-2015: Cross-cutting ICT KETs
- ICT-29-2014: Development of novel materials & systems for OLED lighting

- ICT-29-2016: Photonics KET 2016
- ICT-30-2017: Photonics KET 2017
- ICT-31-2017: Micro- and nanoelectronics technologies

+1) ICT Cross-Cutting Activities

- ICT-30-2015: **Internet of Things and Platforms for Connected Smart Objects**
- ICT-31-2014: **Human-centric Digital Age**
- ICT-32-2014: **Cybersecurity, Trustworthy ICT**
- ICT-33-2014: Trans-national co-operation among National Contact Points

Other activities and calls

- EU-Japan
  - Net Futures, 5G Networks, IoT/Cloud/Big Data platforms in social application contexts, Experimental testbeds on Information-Centric Networking
- EU-Brazil
  - Advanced Cyber Infrastructure, Cloud Computing, IoT Pilots, 5G Networks
- EU-South Korea
  - 5G Networks, IoT, Federated Cloud resource brokerage for mobile cloud services
- EU-China: Future Internet
- EU-Mexico: ICT

Activities planned for 2018-2020

- **Five main activity lines** have been identified:
  1. Technologies for Digitizing European Industry
  2. European Data Infrastructure: HPC, Big Data and Cloud technologies
  3. 5G
  4. Next Generation Internet (NGI)
  5. Cross-cutting activities

1) Technologies for Digitizing European Industry (1/2)

- ICT-01-2019: Computing technologies and engineering methods for cyber-physical systems of systems
- ICT-02-2018: **Flexible and Wearable Electronics**
- ICT-03-2018-2019: Photonics Manufacturing Pilot Lines for Photonic Components and Devices
- ICT-04-2018: Photonics based manufacturing, access to photonics, datacom photonics and connected lighting
- ICT-05-2019: Application driven Photonics components
- ICT-06-2019: Unconventional Nanoelectronics

1) Technologies for Digitizing European Industry (2/2)

- ICT-07-2018: Electronic Smart Systems (ESS)
- ICT-08-2019: Security and resilience for collaborative manufacturing environments
- ICT-09-2019-2020: Robotics in Application Areas
- ICT-10-2019-2020: Robotics Core Technology

2) European Data Infrastructure: HPC, Big Data and Cloud technologies

- ICT-11-2018-2019: **HPC and Big Data** enabled Large-scale Test-beds and Applications
- ICT-12-2018-2020: **Big Data** technologies and extreme-scale analytics
- ICT-13-2018-2019: Supporting the emergence of data markets and the data economy
- ICT-14-2019: Co-designing Extreme Scale Demonstrators (EsD)
- ICT-15-2019-2020: **Cloud Computing**
- ICT-16-2018: Software Technologies

3) 5G

- ICT-17-2018: 5G End to End Facility
- ICT-18-2018: 5G for cooperative, connected and automated mobility (CCAM)
- ICT-19-2019: Advanced 5G validation trials across multiple vertical industries
- ICT-20-2019-2020: **5G Long Term Evolution**
- ICT-21-2018: EU-US Collaboration for advanced wireless platforms
- ICT-22-2018: EU-China 5G Collaboration
- ICT-23-2019: EU-Taiwan 5G collaboration

4) Next Generation Internet (NGI)

- ICT-24-2018-2019: Next Generation Internet - An Open Internet Initiative
- ICT-25-2018-2020: Interactive Technologies
- ICT-26-2018-2020: Artificial Intelligence
- ICT-27-2018-2020: **Internet of Things** ICT-28-2018: Future Hyper-connected Sociality
- ICT-29-2018: A multilingual Next Generation Internet
- ICT-30-2019-2020: An empowering, inclusive Next Generation Internet
- ICT-31-2018-2019: EU-US collaboration on NGI

5) Cross-cutting activities

- ICT-32-2018: STARTS – The Arts stimulating innovation
- ICT-33-2019: Startup Europe for Growth and Innovation Radar
- ICT-34-2018-2019: Pre-Commercial Procurement open
- ICT-35-2018: Fintech: Support to experimentation frameworks and regulatory compliance

HUNGARY

National and EU R&D&I resources

Hungarian Academy of Sciences (Magyar Tudományos Akadémia - MTA)

Hungarian Association for Innovation

Innovations in the Hungarian telecommunication

Hungarian innovation price examples

National and EU R&D&I resources

Research & development & innovation

- Innovation fund
  - NIH - National Office for Innovation
  - Yearly € 100-120 million
  - 50% paid by enterprises (innovation fee)
  - 50% paid by the state (central budget)
- New Hungary Development Plan 2014-2020
  - Economy Development Operative Programme R&D Priority
  - Yearly € 130 million
- Horizon 2020 EU Research Programme 2014-2020
  - € 80 - 100 billion yearly (directly from the EU)

Hungarian Academy of Sciences (1/4)

Science policy

- The **Science Policy of Hungary in the EU** published in 2006 by MTA
  - New strategic direction: **preferring basic research**
- **Research challenges**
  - Existing technologies are exhausting
  - New technologies come mostly from basic research
  - Bad principle to expect direct financial results from research
  - EU is lagging behind the USA and Japan
- **Provisions/funding**
  - Foundation of European Research Council
  - Foundation of European Institute of Innovation & Technology (EIT)
  - 7th Framework Programme (2007-2013) and Horizon 2020 (2014-2020)

Hungarian Academy of Sciences (2/4)

Civic duties of the Academy

- Supports the cultivation and research of sciences
- When asked by the National Assembly or the Government, **in relevant issues** i.e. in issues regarding science, education, society, the environment or the economy, it makes its **professional views public**
- Helps the **development of language** and the **cultivation of science in Hungarian**
- Preserves the **purity of scientific life and the freedom of scientific research and self-expression**
- Keeps up links with scientific research carried out in Hungarian in foreign countries, supports across-the-border science
- Announces scientific results to the public

Hungarian Academy of Sciences (3/4)

Research Centers and Institutes 1/2

- MTA Alfréd Rényi Institute of **Mathematics**
- MTA Institute for **Computer Science and Control**
- MTA Research Centre for **Astronomy and Earth Sciences**
- MTA Centre for **Energy Research**
- MTA Institute for **Nuclear Research**
- MTA Wigner Research Centre for **Physics**
- MTA Research Centre for **Natural Sciences**
- MTA Institute of **Experimental Medicine**

Hungarian Academy of Sciences (4/4)

Research Centers and Institutes 2/2

- MTA **Biological** Research Centre
- MTA Centre for **Agricultural** Research
- MTA Centre for **Ecological** Research
- MTA Centre for **Social Sciences**
- MTA Research Centre for **Economic and Regional Studies**
- MTA Research Institute for **Linguistics**
- MTA Research Centre for The **Humanities**

Hungarian Association for Innovation (1/3)

- HAI as a professional and employer's business federation focuses on the **economy stimulating role of innovation**
  - Only legal entities (enterprises, research institutes, universities, etc.) can be the members of HAI
  - Its objective is that the ambition of permanent renewal should be a genuine resource for the Hungarian economy by research, development and design
- Intends to **promote the creation, spread, transfer, adoption and the practical utilization of intellectual products** so that
  - The performance and the income generating potential of the companies and the Hungarian economy should be increased
  - By making use of innovation the modernization and the development of economy as a result of it should be accelerated

Hungarian Association for Innovation (2/3)

- **Hungarian Innovation Grand Price**
  - A company is honored with this annually given grand prize which is registered in Hungary and realized meaningful and very profitable innovation in the previous year
  - At the same time ministries also give innovation prices
- **National Scientific and Innovation Contest for Youth**
  - During the contest it is necessary to solve any scientific problem in the area of natural sciences (biology, mathematics, physics, chemistry, geography), environment protection, informatics, telecommunication, computer science and technical sciences

Hungarian Association for Innovation (3/3)

- **EU Contest for Young Scientists**
  - Hungarian Association for Innovation supports the participation at the EU Contest for Young Scientists, the International Scientific and Innovation Contest, etc.
- **Hungarian Association for Innovation Media Prize**
  - Media Prize is given for journalists, reporters dealing with innovation

Innovations in the Hungarian telecommunication (1/2)

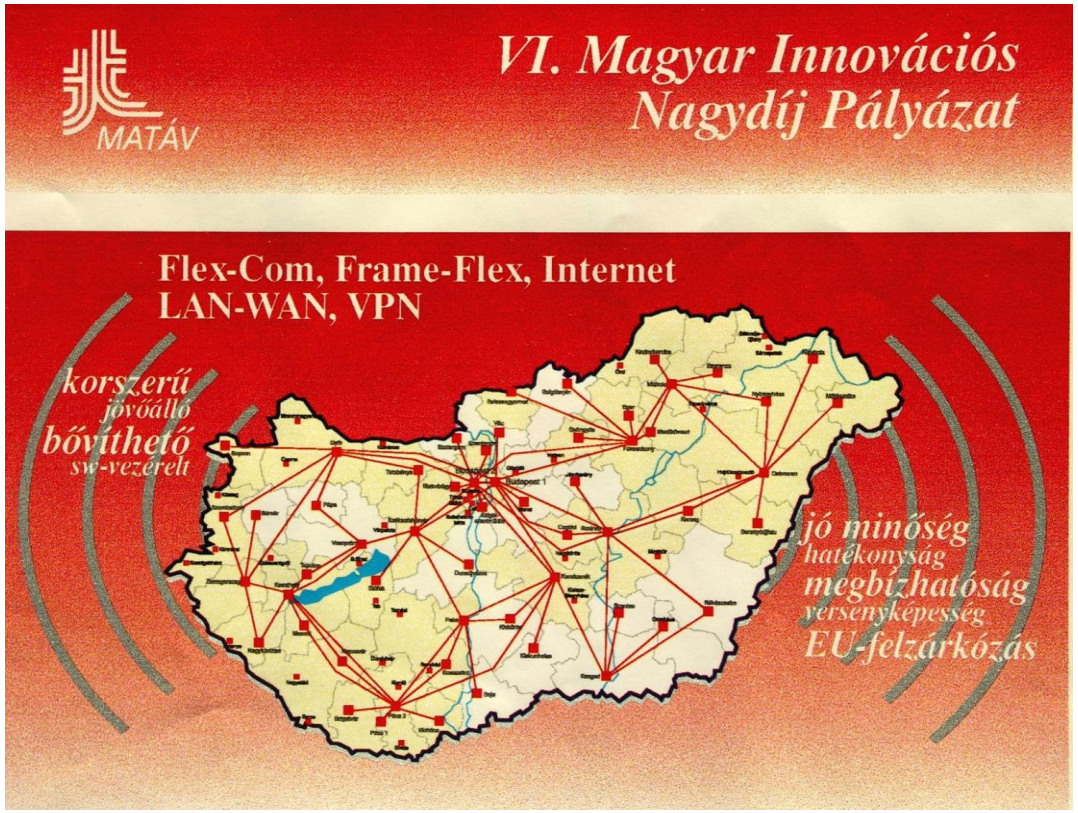
- **Before 1990 (Hungarian Post "era")**
  - Telephone, telex, telegram, analog leased line, packet switched data communication
- **After 1990**
  - 1990: analog mobile (450 MHz)
  - 1992: digital leased line
  - 1994: GSM mobile (900 MHz)
  - 1995: ISDN, free/premium numbers (intelligent network), first text message in Hungary sent over Westel 900 network
  - 1996: managed leased line, satellite communication
  - 1997: Internet
  - 1998: digital cable television (CATV)

Innovations in the Hungarian telecommunication (2/2)

- **After 1990 (cont'd)**
  - 1999: IP telephone
  - 2000: GSM mobile (1800 MHz), ADSL
  - 2002: Magyar Telekom was the world's first service provider to introduce multimedia messaging (MMS) for sending text, image, voice and video
  - 2005: 3G/UMTS
  - 2008: digital terrestrial broadcasting (TV and radio)
  - 2010: Magyar Telekom was the world's first in IPTV over CATV network
  - 2011: 4G (Magyar Telekom's 4G mobile Internet network has been ranked first by Ookla Speedtest)
  - 2017: 5G trial by Magyar Telekom and Ericsson

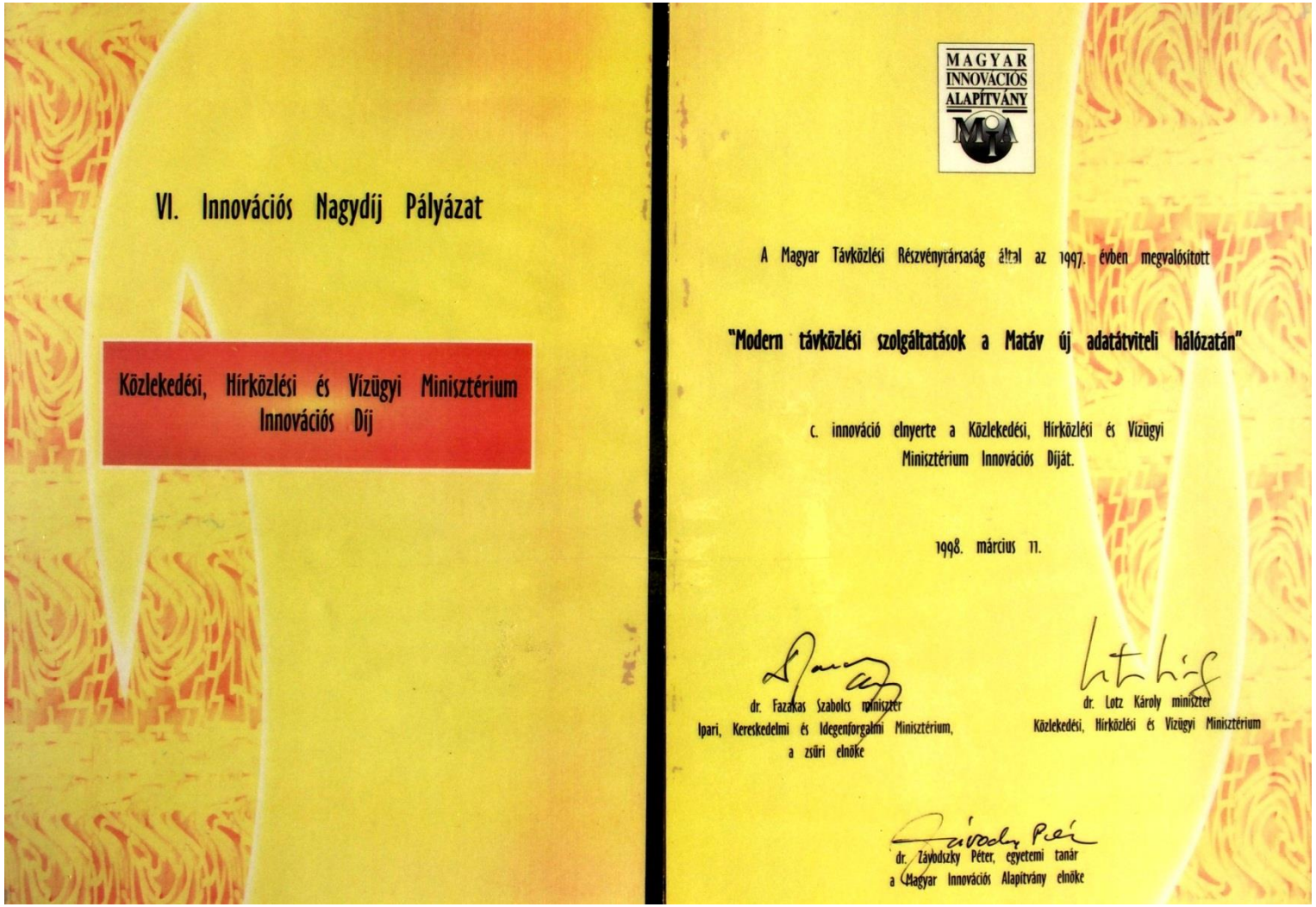
Hungarian innovation price examples (1/5)

HUNGARIAN INNOVATION PRICE IN TELECOMMUNICATION ’98



Hungarian innovation price examples (2/5)

HUNGARIAN INNOVATION PRICE IN TELECOMMUNICATION ’98



VI. Innovációs Nagydíj Pályázat

Közlekedési, Hírközlési és Vízügyi Minisztérium
Innovációs Díj

MAGYAR INNOVÁCIÓS ALAPÍTVÁNY

A Magyar Távközlési Részvénytársaság által az 1997. évben megvalósított

"Modern távközlési szolgáltatások a Matáv új adatátviteli hálózatán"

c. innováció elnyerte a Közlekedési, Hírközlési és Vízügyi Minisztérium Innovációs Díját.

1998. március 11.

dr. Fazakas Szabolcs miniszter
Ipari, Kereskedelmi és Idegenforgalmi Minisztérium,
a zsűri elnöke

dr. Lotz Károly miniszter
Közlekedési, Hírközlési és Vízügyi Minisztérium

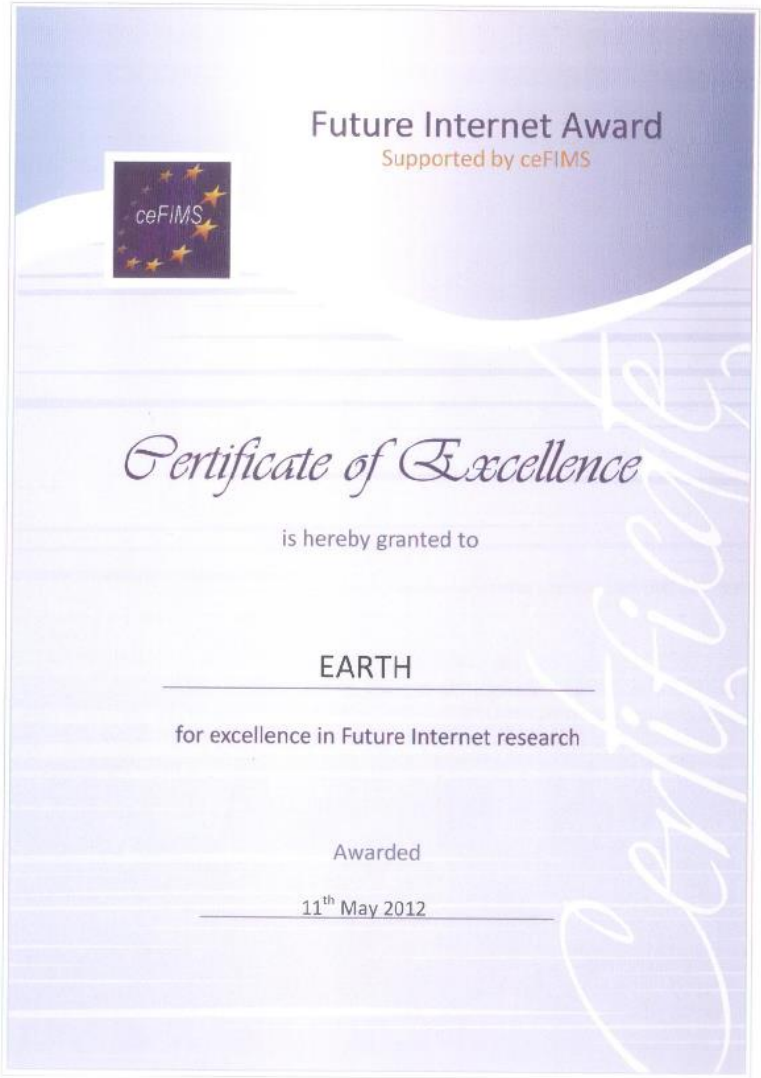
dr. Závodszky Péter, egyetemi tanár
a Magyar Innovációs Alapítvány elnöke

Innovation Price given by the ministry for transportation, communication and rural development for **“Modern Telecommunication Services at Matáv”**

Hungarian innovation price examples (3/5)

Future Internet Award ‘12

- Certificate of Excellence to EARTH (EU FP7 project) for excellence in Future Internet research
- Project members from Hungary: BME & Ericsson



Hungarian innovation price examples (4/5)

DELFIN Award for Sustainable Development ‘12

ERICSSON

ZÖLD HÁLÓZATOK ÉS AZ earth

Energy Aware Radio and neTwork tecHnologies

DR. GÓDOR ISTVÁN
ERICSSON MAGYARORSZÁG

Green Networks: Network Management Functionalities

Hungarian innovation price examples (5/5)

DELFIN Award for Sustainable Development ‘12

- Innovation Price given by Magyar Telekom for **Realized Innovation for Sustainability**

- DELFIN: Díj egy Elkötelezett Fenntartható Innovatív Nemzedékért

THANK YOU FOR YOUR ATTENTION!

Engineering Management BMEVITMMB03
BME Faculty of EE &IT MSc Majors
Economic & human themes

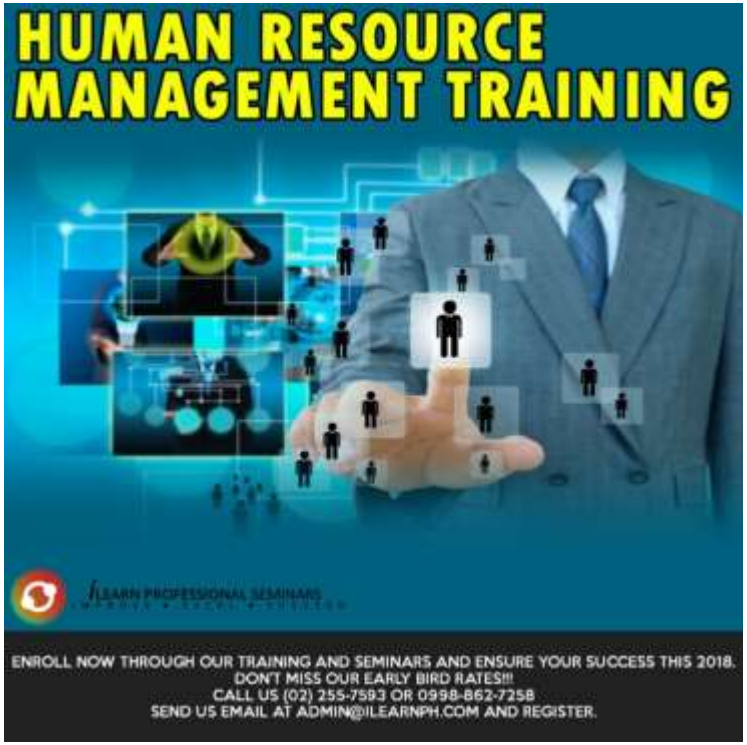
Human- and Organisation Management

Zsuzsanna KÓSA PhD

BME Dept. Telecommunications and Media Informatics
Budapest, spring of 2018

Overview

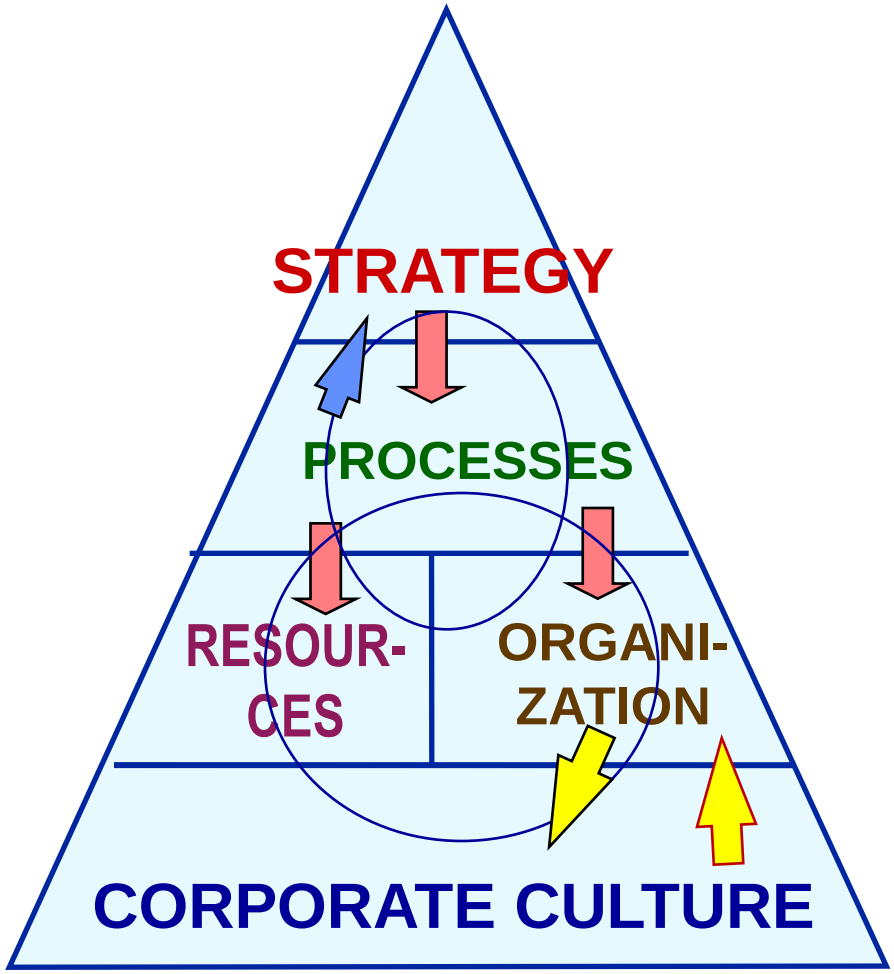
- Business strategy & functional managements
- Process management
- Organization development
- Human manager's role
- Leadership
- Regular Employment
- Unregular employment
- Workforce with special needs
- Organizational knowledge
- Influence of corporate culture



http://www.ilearnph.com/human-resources-management/

Business strategy defines functional managements

- Business strategy is the key to functional management
- Processes should serve the whole business
- Organization should serve the processes
- Business and corporate culture will influence them



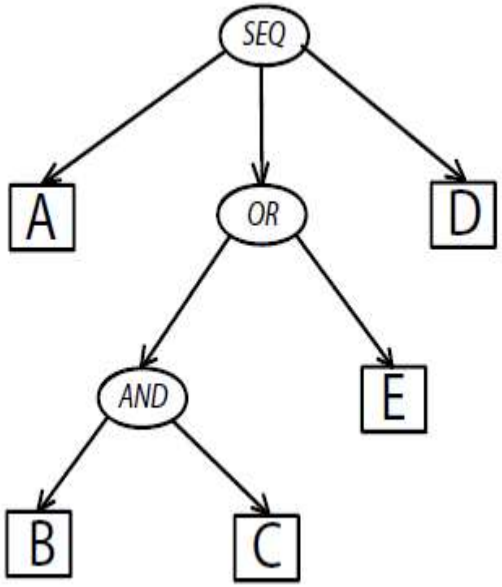
Process management

Business process reengineering

-See the output needed at the end of the processes

-Calculate the minimal input (resources + workforce) needed

-Plan the most efficient process to produce the output



Workflow Trees for Representation and Mining of Implicitly Concurrent Business Processes
http://www.merl.com/publications/TR2008-034

Business process management

- Map all human-made and machine-made processes

- Define quality indicators to each processes

- Build up a continuous monitoring system to measure process-quality indicators

-Improve monitored processes to achieve better quality scores

Organization development

Process based

-Bottom up aproach

-Starts from the stable part of processes,

-Organisational units & their role in processes is clear

-There are no paralell units and processes

-Everything is clearly visible

This is a beautyfull dream, but rarely happens!!

Person related

-Top down approach

-There are tasks and responsibilities to be taken

-Who is able to do them?

-Who can cooperate with the others

-Is there anything left to do?

-Is there someone left to empower?

This is a bad dream, but happens very often!!

http://www.janthony.ašia/services/organization.html

Human manager's role

To **administrate** the employment:

-employment contracts

-managers' contracts

-rent some workforce

-Tax issues related to the staff

-Social welfare of the staff

-Normative and individual compensation package of the staff & managers

To **prepare decisions**:

-Assuring workforce needed

-Enhancing skills the workforce

-Seaking for new managers from outside

-Staff reduction if it is needed

-Releasing managers when it is necessary

Further reading http://www.web-books.com/eLibrary/ON/B0/B58/096MB58.html

Leadership

How to lead a human comunity?

-Responsibity for the group

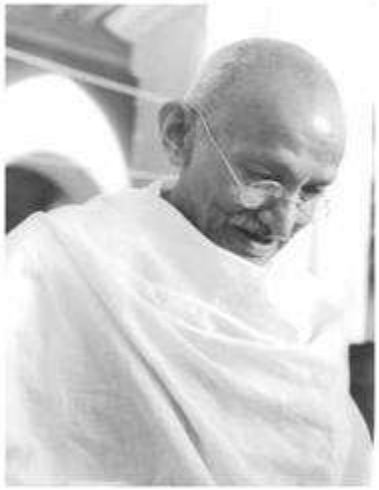
-Credibility

-Clear directions

-Stability on style

-Perception of the nonverbal reactions

-Intuition



http://www.infed.org/leadership/traditional_leadership.htm

How to become a leader?

-Ambition

-Professional credibility

-Managerial skills: understand, communicate, delegate, timing, integrate

-Matured personality

-Situation

Regular Employment

Working hours:

•40-44 hour / 5 workday-week

•Minimum 36 hour/week

•Maximum 12 hours/day

Period of contract

-can be definit or undefinit

Wages

-There is a minimum wage for all

-There is a minimum wage for skilled persons

http://www.clinebell-law.com/practice_areas.html

Taxing

-Income tax & social contribution

Special groups with regular employment

- Civil servants & public employees

- Military & security service

- Health care

- Industrial 3 shift workers (in continuous production)

Unregular employment

Legal forms:

- Part time jobs
- Shared jobs
- Distance working
- Ocasional working official

Existing but illegal forms:

- Ocasional working unofficial
- Temporary working with immigrants without permission

http://onlineworkeasyjob.blogspot.hu/2012/06/online-part-time-job.html

Invoiced forms:

- ❑ Self employment
- ❑ Rented workforce
- ❑ Student working

Less taxed, legal „withening forms”:

- ▪ Helping in family firms
- ▪ Household working

Workforce with special needs

Handicapped persons:

•Disabled, blind, deaf

Age groups:

•Beginner entrants (0-3 years)

•Matured staff (5 years before pension age)

•Elderly staff (pension age)

http://labourlist.org/2014/10/under-david-cameron-disabled-people-are-being-let-down-and-left-behind/

Social status:

• Reintegrating mothers (after having child)

• Single parents (mothers)

• Ethnic minorities

Living place:

- Commuters

- Immigrants

- Home workers

Organizational knowledge

Knowledge mapping

-To know the skills of the existing workforce

-The core knowledge

-The language skills

-Previous working exeriences

Search for a new project

Evaluate as an intangible asset

https://www.interfacing.com/knowledge-management-software-companies

Build up knowledge transfer

-Best practices on intraweb

-Travelling reports

-Presentations

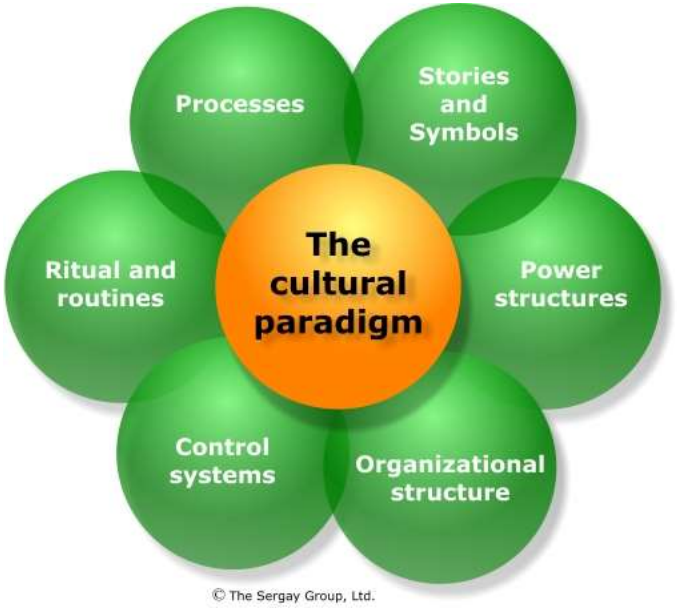
-Mentoring systems

Goal is to externalize or share individual knowledge within the organisation

Influence of corporate culture

National business culture is based on national culture:

- Symbols
- Geros
- Rituals
- Values, subconsious beliefs



Corporate culture depends on the business:

- Sector
- Size
- History
- Ownership

http://jameskaskade.com/?p=1586

Engineering Management BMEVITMMB03
BME Faculty of EE & IT MSc Majors
Economic & Human Themes

PRODUCT MANAGEMENT

István Gódor PhD & prof. Imre Abos &
prof. Gyula Sallai

BME Dept. Telecommunications and Media Informatics

Budapest, Spring of 2018

Content

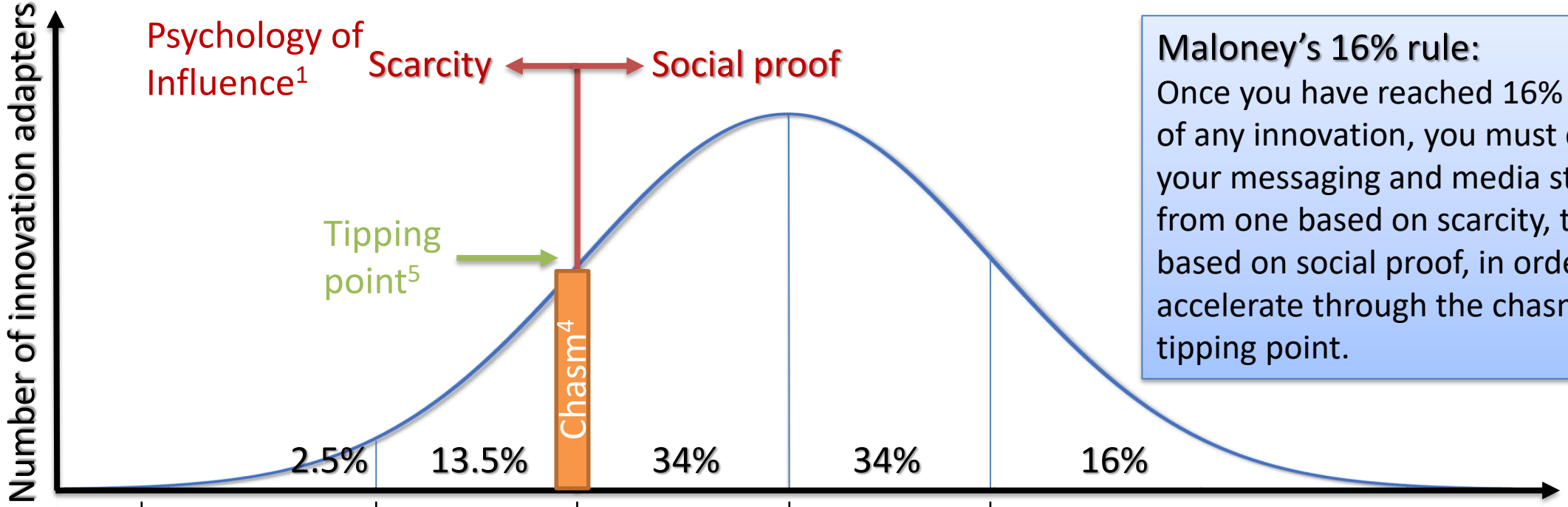
- Adoption of innovations
- Hype cycle
- The product
- Product life cycle & phases
- Market segmentation & sales
- Disruptive areas

ADOPTION OF INNOVATIONS

Adoption process of innovations

- **Awareness**: the customer becomes aware of the existence of the innovation without having information about it
- **Interest**: the customer feels incentive to get knowledge with respect to the innovation
- **Evaluation**: the customer makes decision to try the innovation or not
- **Trial**: the customer tries the innovation, in such a way it is possible to refine what value the innovation represents for him/her
- **Adoption**: the customer decides to use the innovation regularly

“Simple” model of adoption of innovation 1/8



Maloney’s 16% rule:
Once you have reached 16% adoption of any innovation, you must change your messaging and media strategy from one based on scarcity, to one based on social proof, in order to accelerate through the chasm to the tipping point.

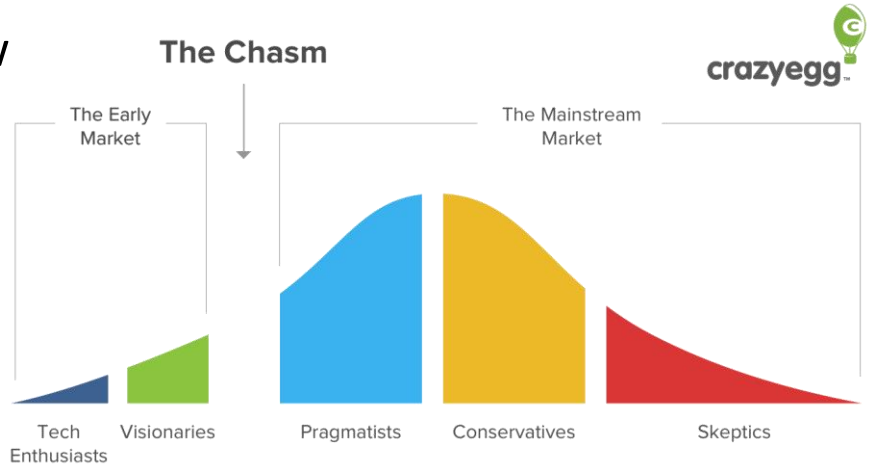
Adoption profile[2]	Innovators	Early adopters	Early majority	Late majority	Late mass / laggards
Psycho-graphic[2]	Technologists	Visionaries	Pragmatists	Conservatives	Sceptics
Social techno-graphic[3]	Creators		Critics & Collectors	Joiners & Spectators	Inactives

1: Robert Cialdini
2: Everett Rogers
3: Forresters
4: Geoffrey Moore
5: Malcolm Gladwell

“Simple” model of adoption of innovation 2/8

Overcome the Chasm

- The Early Majority (Pragmatists) **does not talk** to the Early Adopters (Visionaries), hence there is a huge Chasm
  - The Early Adopters are buying a **revolutionary change agent**
    - Expect a clear **discontinuity** between the old and the new
    - Expect clear **strategic advantages**
    - Tolerate **bugs** and **glitches**
  - The Early Majority is buying **evolutionary productivity improvement**
    - Want to **minimize the discontinuity** with the old way
    - Want innovations to **enhance established business processes**
    - Expect a more of less **bug free** product



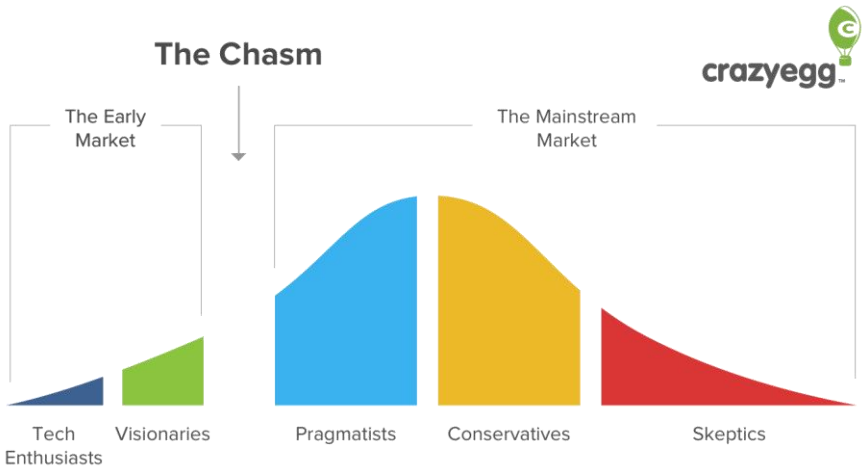
Source: https://www.crazyegg.com/blog/product-adoption-to-transform-marketing/

“Simple” model of adoption of innovation 3/8

Stage 1 – Innovators – Technology Enthusiasts

Key role: gatekeeper to the Early Adopters

- Primary motivation
  - Learn about new **technologies for their own sake**
- Key characteristics
  - Strong aptitude for **technical information**
  - Like to **alpha test** new products
  - Can **ignore** any **missing elements**
  - Do whatever they can to **help**
- Challenges
  - Want unrestricted **access** to top technical people
  - Want **no-profit pricing** (preferably free)



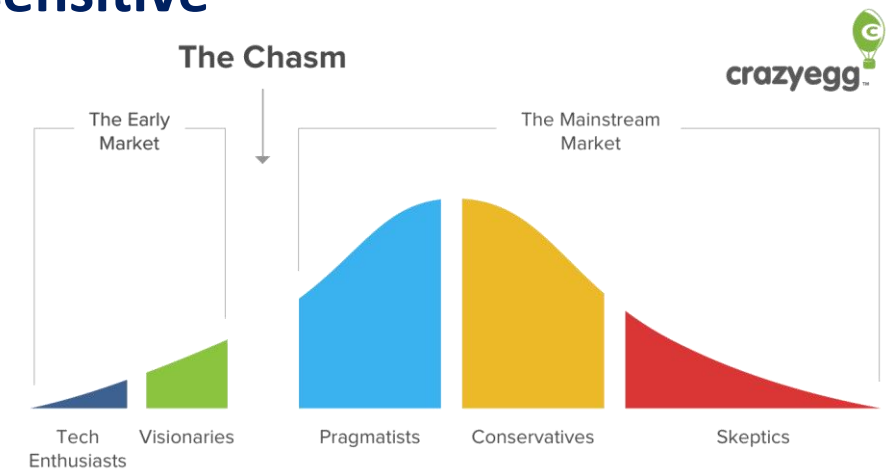
Source: https://www.crazyegg.com/blog/product-adoption-to-transform-marketing/

“Simple” model of adoption of innovation 4/8

Stage 2 – Early Adopters – Visionaries

Key role: fund the development of the early market

- Primary motivation
  - Gain dramatic competitive advantage via **revolutionary breakthrough**
- Key characteristics
  - Perceive order-of-magnitude gains – so **not price sensitive**
  - Great imaginations for **strategic applications**
  - Attracted by **high-risk, high-reward** propositions
  - Will help **supply** the **missing elements**
- Challenges
  - Want rapid **time-to-market**
  - Demand **high degree of customization** and support



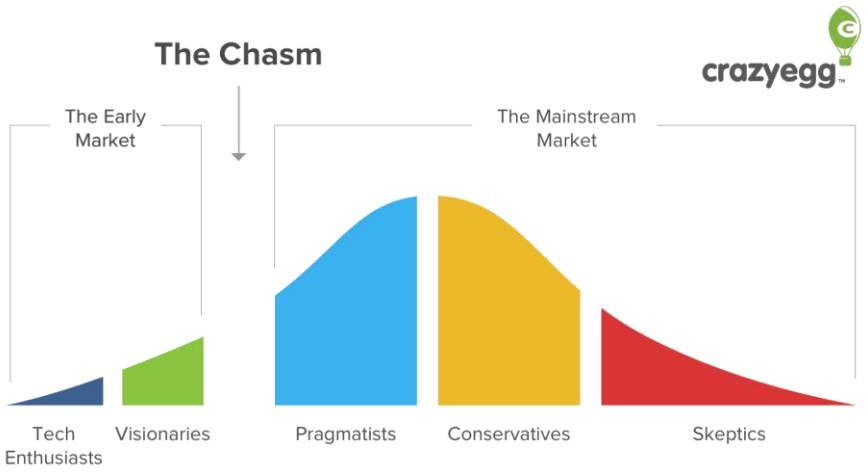
Source: https://www.crazyegg.com/blog/product-adoption-to-transform-marketing/

“Simple” model of adoption of innovation 5/8

Stage 3 – Early Majority – Pragmatists

Key role: bulwark of the mainstream market

- Primary motivation
  - Gain sustainable **productivity improvements** via **evolutionary** change
- Key characteristics
  - Astute **managers of mission-critical application**
  - Understand **real-world** issues and **tradeoffs**
  - Focus on **proven applications**
  - Like to go with the **market leader**
- Challenges
  - Insist on good **references from trusted colleagues**
  - Want to see the solution in production at the **reference site**



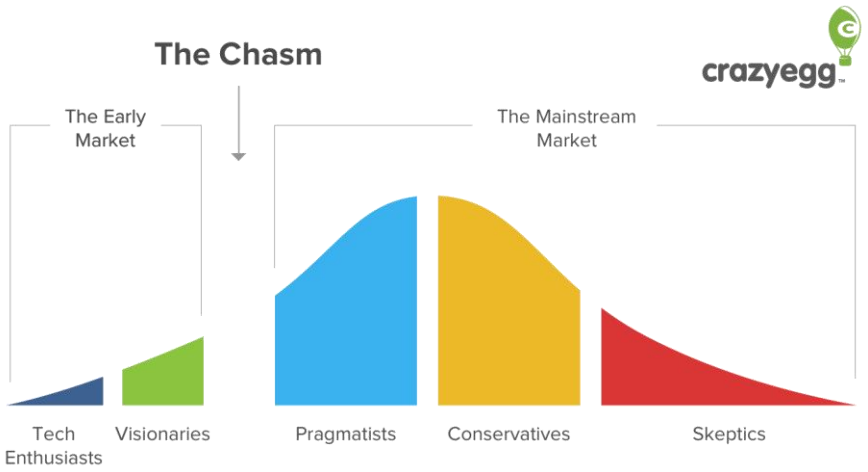
Source: https://www.crazyegg.com/blog/product-adoption-to-transform-marketing/

“Simple” model of adoption of innovation 6/8

Stage 4 – Late Majority – Conservatives

Key role: extend product life cycles

- Primary motivation
  - Just **stay even** with the competition
  - Avoid **competitive disadvantage**
- Key characteristics
  - Better with **people** than technology
  - **Risk averse** and **Price-sensitive**
  - Highly reliant on a single, **trusted advisor**
- Challenges
  - Need **completely pre-assembled** solutions
  - Would benefit from value-added services but **do not want to pay** for them



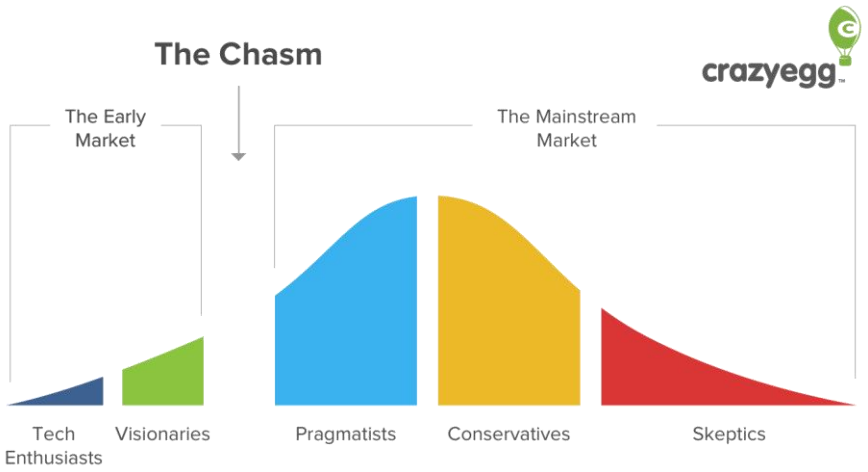
Source: https://www.crazyegg.com/blog/product-adoption-to-transform-marketing/

“Simple” model of adoption of innovation 7/8

Stage 5 – Late mass / Laggards – Sceptics

Key role: retard the development of high-tech markets

- Primary motivation
  - Maintain **status-quo**
- Key characteristics
  - Good at **debunking marketing hype**
  - **Disbelieve** productivity-improvement **arguments**
  - Believe in the **law of unintended consequences**
  - Like takin a **contrarian** position
  - Seek to **block purchases** of new technology
- Challenges
  - Not a **customer** and can be **formidable opposition** to early adoption



Source: https://www.crazyegg.com/blog/product-adoption-to-transform-marketing/

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Characteristics from Innovators to Laggards

Source: https://www.crazyegg.com/blog/product-adoption-to-transform-marketing/

Innovators

Visionaries and Enthusiasts

- Dream realizers
- Drive change
- Aren’t afraid to fail
- Explore in iterations
- High tolerance for risk, uncertainty and ambiguity
- Adventurers
- Change initiators
- Internally motivated to change
- Respected by EAs; doubted by the mass

Early Adopters

- Evangelists
- Embrace change
- Self-efficacy
- Like to be first to try, use, engage, buy
- Try out new ideas in careful way
- Inspired by the new
- Like integrating new ideas in useful ways
- Influencers – like to convey ideas
- Respected by majority

Early Majority

Mainstream Adopters

- Pragmatists
- Accept change (sooner than LM)
- Deliberate
- Adopt if practical – weigh out pros & cons; think it out
- Go along; seldom lead
- Helps it gain mass appeal
- Wait until it has been successful in practice

Late Majority

- A bit skeptics
- Accept change (later than EM)
- Adopt after proven
- Often adopt out of necessity, not choice
- Goes along with peers
- Like to know rules
- Creatures of habit
- Jumps in when sees “everybody” is doing it

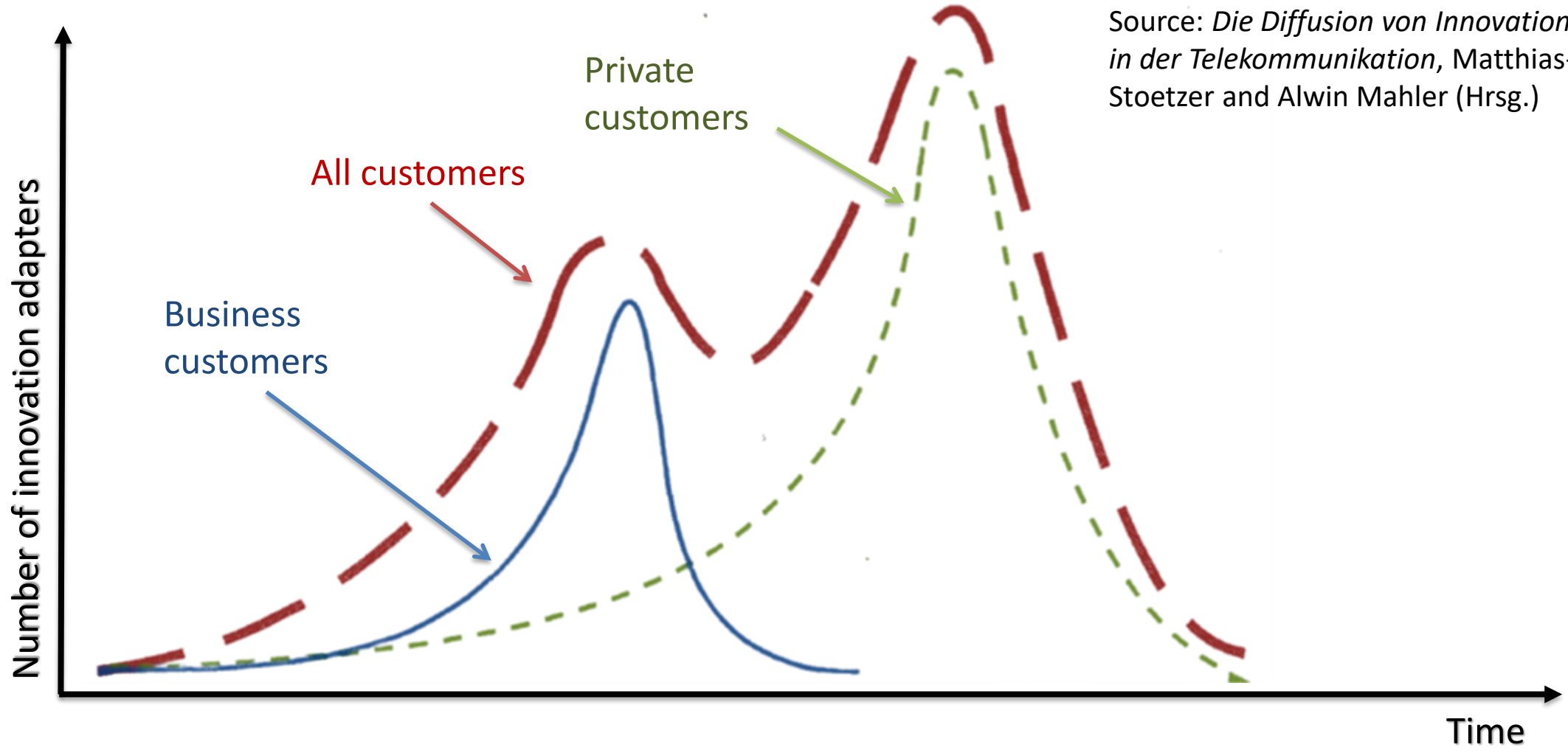
Laggards

Resisters

- Change averse
- Value tradition
- Not leaders
- Suspicious of new innovations
- Often wait until forced to adopt
- Feel threatened or very uncomfortable by uncertainty and change
- Not going to buy in to new ideas

Source: The Center for Creative Emergence 2011 based on *Diffusion of Innovation* by Everett Rogers and *Crossing the Chasm* by Geoffrey Moore

Complex model of adoption of innovation

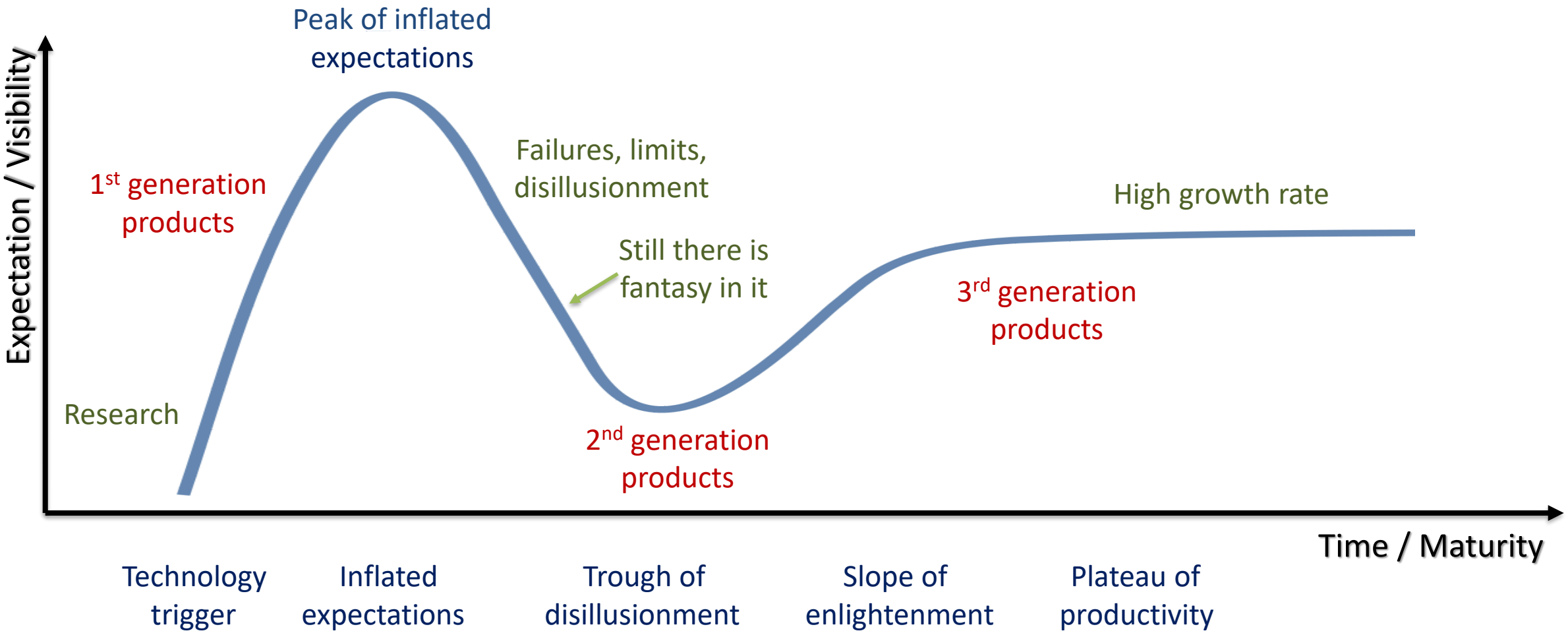


Source: *Die Diffusion von Innovationen in der Telekommunikation*, Matthias-W. Stoetzer and Alwin Mahler (Hrsg.)

HYPE CYCLE

Hype cycle

Source:
https://www.gartner.com/technology/research/methodologies/hype-cycle.jsp



How hype cycle works (1/2)

Five key phases of a technology's life cycle

Source: https://www.gartner.com/technology/research/methodologies/hype-cycle.jsp

- **Technology Trigger**
  - A potential technology breakthrough kicks things off. Early proof-of-concept stories and media interest trigger significant publicity. Often no usable products exist and commercial viability is unproven.
- **Peak of Inflated Expectations**
  - Early publicity produces a number of success stories — often accompanied by scores of failures. Some companies take action; many do not.
- **Trough of Disillusionment**
  - Interest wanes as experiments and implementations fail to deliver. Producers of the technology shake out or fail. Investments continue only if the surviving providers improve their products to the satisfaction of early adopters.

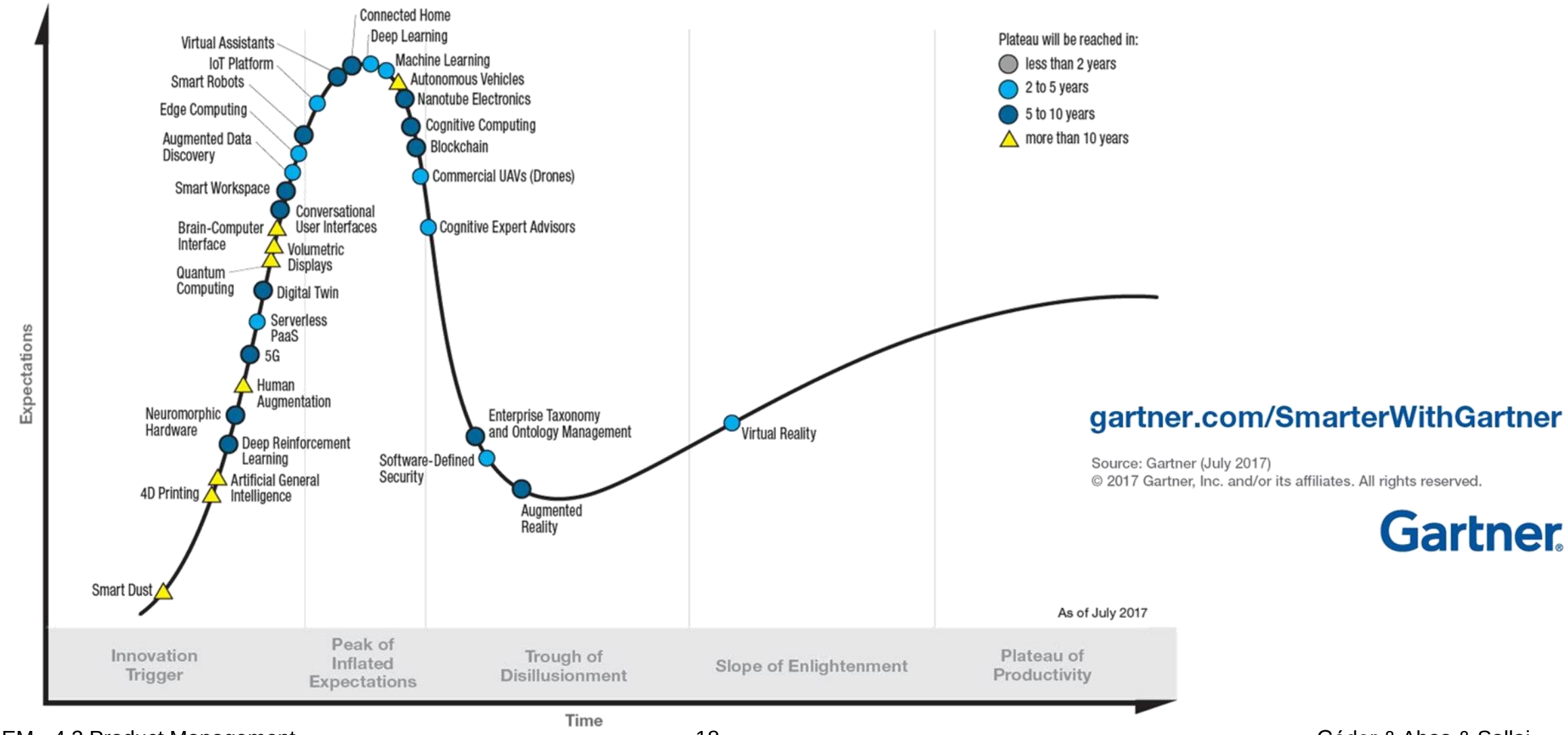
How hype cycle works (2/2)

Five key phases of a technology's life cycle

Source: https://www.gartner.com/technology/research/methodologies/hype-cycle.jsp

- **Slope of Enlightenment**
  - More instances of how the technology can benefit the enterprise start to crystallize and become more widely understood. Second- and third-generation products appear from technology providers. More enterprises fund pilots; conservative companies remain cautious.
- **Plateau of Productivity**
  - Mainstream adoption starts to take off. Criteria for assessing provider viability are more clearly defined. The technology's broad market applicability and relevance are clearly paying off.

Hype cycle for emerging technologies 2017



THE PRODUCT

What is a product?

- **The product is the whole of physical, aesthetic and symbolic behaviors to meet the customers' demand and to offer in the market**
- **Product types**
  - Materialized product (food, phone set, car)
  - Intellectual product (book, music, software)
  - Services (restaurant, telecommunication, car repair)
  - Experience (theatre, concert)
  - Event (sport)
- **Durability**
  - Durable goods (clothes, household appliances)
  - Nondurable goods (food)

Infocommunication products

ICT products

- **Hardware**
  - Server
  - PC, workstation
  - Business informatics equipment
  - Telecommunications CPE
  - Switching equipment
  - Transmission equipment
  - Mobile radio systems
  - Data communication
  - ICT equipment for private networks
- **Software**
  - System software
  - Application software

ICT services

- **Informatics services**
  - IT design
  - IT consulting
  - IT deployment
  - IT system management
  - IT support, maintenance
- **Telecom services**
  - Fixed phone services
  - Mobile phone services
  - Data and leased line services
  - Internet and online services
  - CATV services

Source: EITO (European IT Observatory)
https://www.eito.com/

Product development

- **The aim of product development**
  - Meeting the increasing customer demands
  - Increasing market share
  - Ensuring enterprise growth
  - Keeping and growing competitiveness
  - Generate profit
- **Product development types**
  - **Initiating**: new still unknown product on the market
  - **Following**: already known product on the market
  - **Product enhancement**: adding new features
  - **Product variation**: different products by market segments

Product development process

- Idea management (collecting and selecting ideas)
- Preparing product proposals (product concepts)
- Preparing business plan (product description, market segments, price, marketing methods)
- Realization (product development, cost analysis, market research, price setting)
- Product launch on the market
- Testing launch effectiveness
- Product correction, finalization

In each step business estimations will be taken into account

Product modification

- **Possible modifications based on the experiences of the launch (generally after 6 months - 1 year)**
  - Modification of specification
  - Modification of equipment/service
  - Modification of price
  - Modification of sales channels
  - Modification of customer office
- **Product finalization**
  - Generally after 1-2 modifications
  - During life-cycle management product modification, enhancement may occur

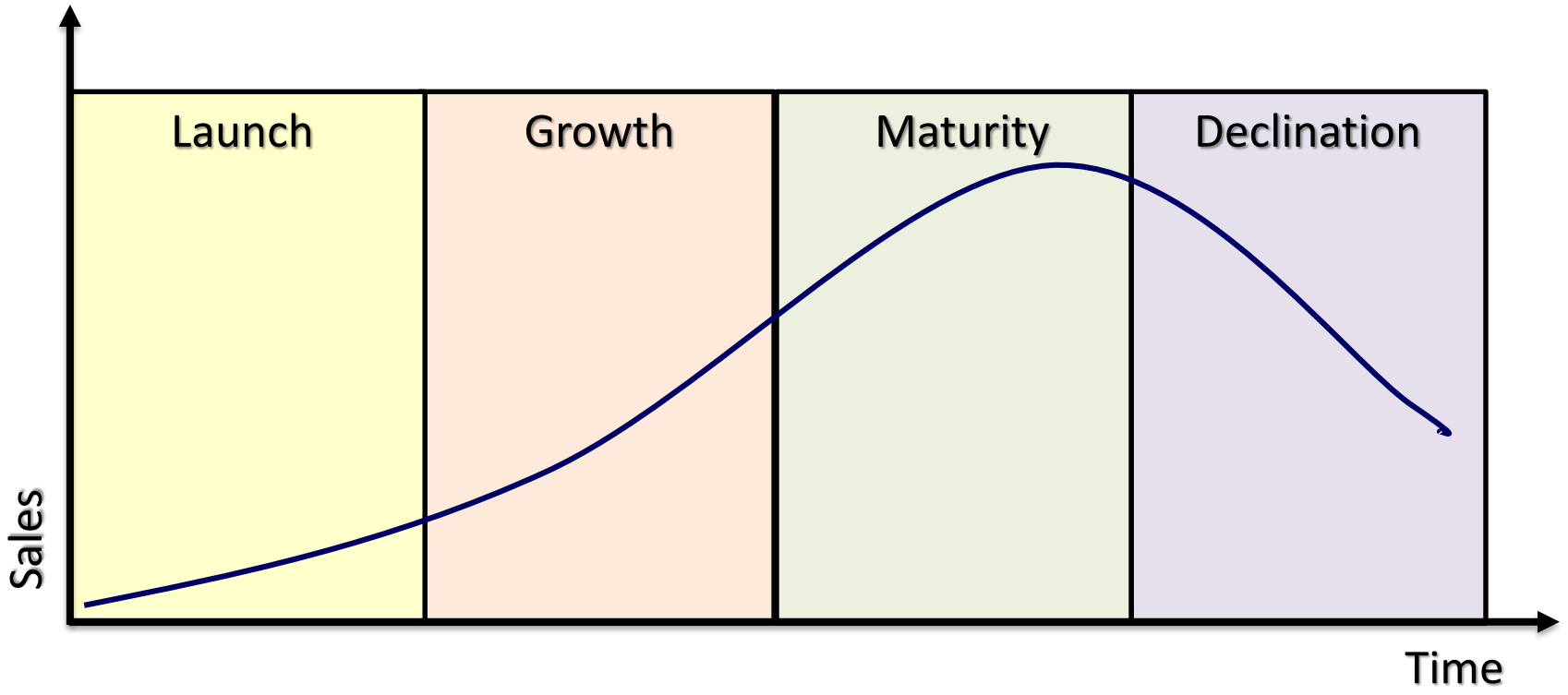
PRODUCT LIFE CYCLE & PHASES

Product life cycle

Life cycle represent the sold amount of the product

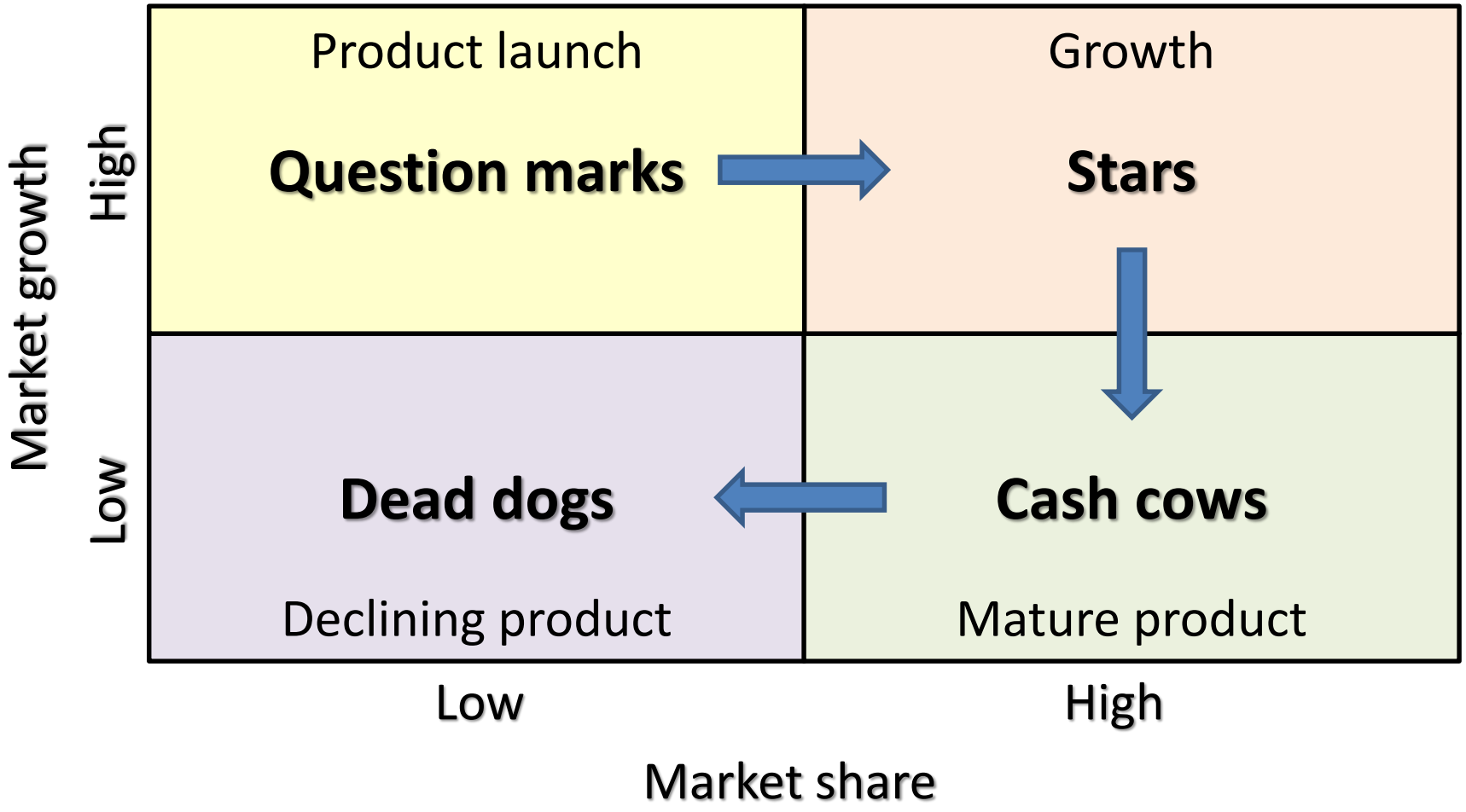
- from market launch
- until withdrawing from the market

as a function of time

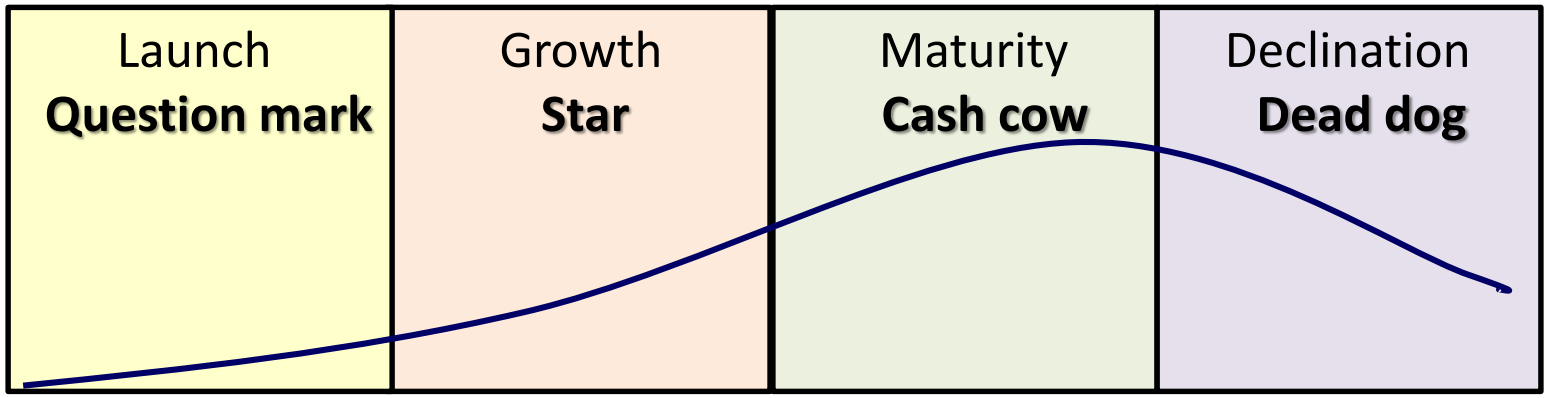


Product life phases

BCG matrix (Boston Consulting Group)



Features of life phases



	Launch **Question mark**	Growth **Star**	Maturity **Cash cow**	Declination **Dead dog**
Traffic	Low	Fast growing	Maximal	Decreasing
Specific cost	High	Average	Average	Low
Profit	Negative	Growing	High	Decreasing
Buyers	Innovators	Early users	Average customers	Late users

The buyers

- **The buyers**: the whole of individuals, enterprises and institutions buying products and services to meet their own demands
- **The buyers' decision process**
  - Problem emergence (need for something)
  - Collecting information (possibilities)
  - Evaluation of alternatives (compare possibilities)
  - Decision for buying (based on own knowledge and others' experience, advices)
  - Post purchase behavior (we have got what we wanted, shall we propose to others, or we keep back others from buying)

Customer value

- **Customer acquisition and retention**
  - Customer acquisition costs about ten times more than their retentions
  - “Tailored” customer care at each customer segment, e.g. at key customers personal customer manager
  - Discounts, actions, bonus points, bonus programs
  - Handling customer complaint (Cisco: Customer Advocacy)
- **Customer life-time**
  - Goal is to maximize customer life-time
  - Maintenance of customer loyalty
- **Customer profitability**
  - Revenue level from a customer (+)
  - Cost of ”customer care” (-)

Product pricing

- **The price is an amount of money, for which a given product can be sold or bought**
- **Price calculation methods**
  - **Cost based pricing** (conventional prices)
    - Manufacturers: cost + profit
    - Sales enterprise: purchase price + margin
  - **Demand oriented pricing** (customer oriented prices)
    - Price based on the buyers' price expectation (market research)
  - **Competition oriented pricing** (competitive prices)
    - Prices competing with the other market players' prices (large enterprises – price leaders, small enterprises – price followers)

Consumers' price sensitivity

- **Price estimation**
  - In itself, based on the features of the product (cheap, expensive, suitable)
  - Compared to similar products, substitute, supplementary products (cheaper, more expensive, similar)
- **Price change estimation**
  - Price elasticity coefficient: showing how will the traffic react on the price change (generally if the price decreases then the traffic increases and vice versa)

$$\text{Price elasticity coefficient (E)} = \frac{\text{Traffic change in \%}}{\text{Price change in \%}}$$

- Price is **non-elastic** if $0 < E < 1$ and the price is **elastic** if $E \geq 1$

MARKET SEGMENTATION & SALES

Market segmentation (1/2)

- **Market segmentation** – splitting the market into pieces by
  - Products or product groups
  - Customer types
- **Product criteria**
  - **Product function**
  - **Product price**
  - **Product reputation**
- **Customer criteria**
  - **Location**: type (town/village) and size of settlement
  - **Demographic**: age, sex, family, (nationality)
  - **Enterprise type**: SME, large enterprise, institution
  - **Societal**: occupation, education, income, life style
  - **Behavior**: product usage, loyalty, personal interest

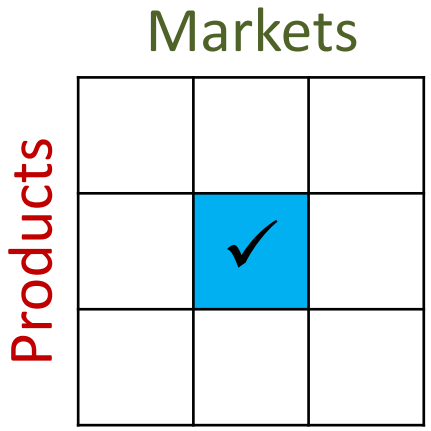
Market segmentation (2/2)

Example of ICT products (function) & markets (enterprise type)

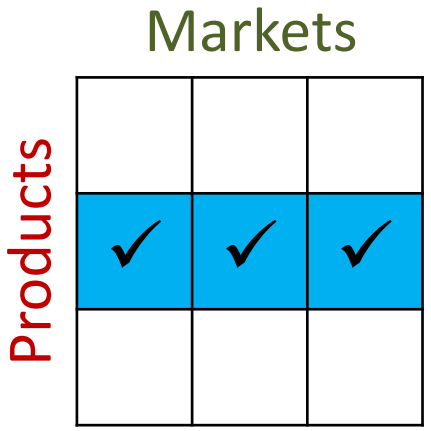
ICT markets

ICT products	Residents	Small enterprise	Medium enterprise	Large enterprise
Fixed phone	✓	✓	✓	✓
Mobile phone	✓	✓	✓	✓
Internet	✓	✓	✓	✓
CATV	✓			
Data services			✓	✓
Private network				✓

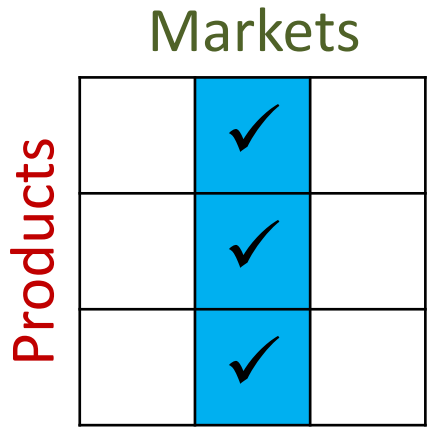
Selection of market targets



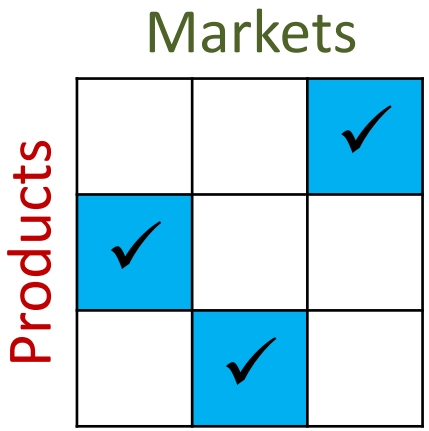
Single segment concentration



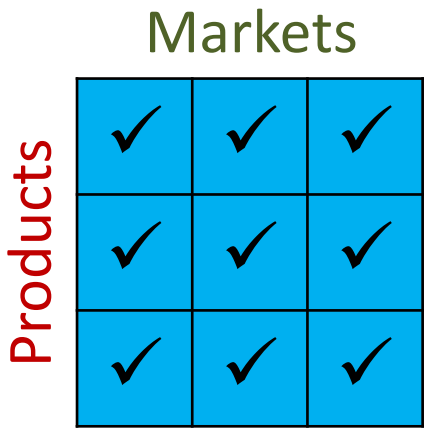
Product specialization



Market specialization



"Selecting" specialization



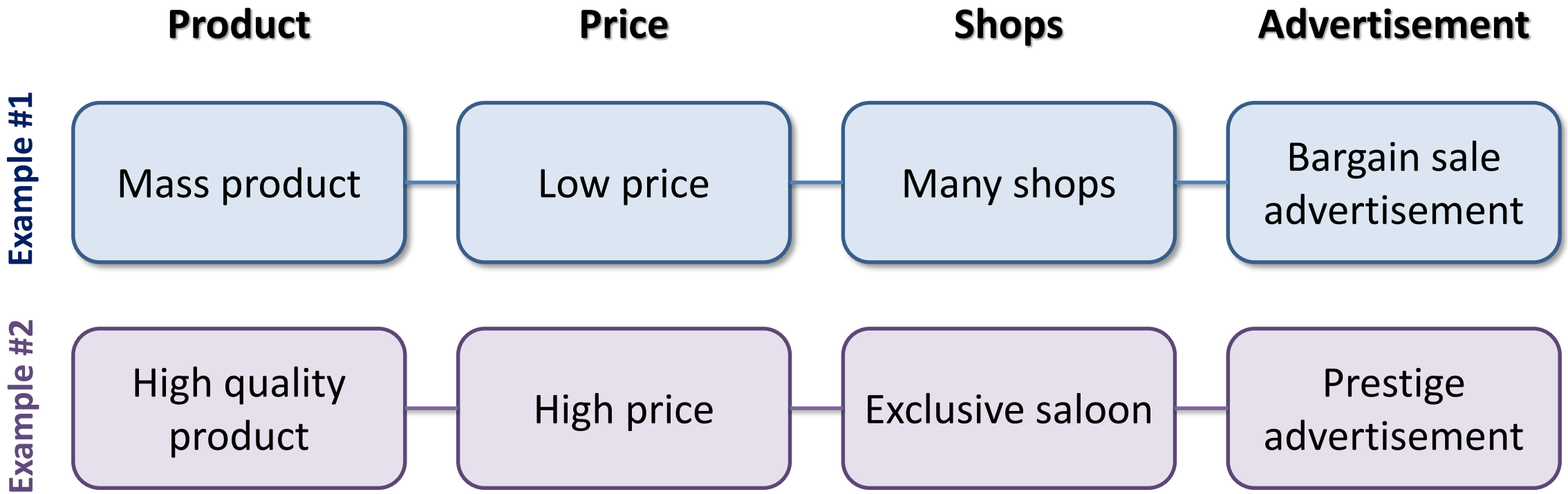
Full market coverage

Sales methods of products

- **Sales**
  - Handing over the product to the buyer against appropriate price
- **Sales methods**
  - **Production oriented (demand driven market)**
    - Demand > offer, „everything” can be sold
    - In order to meet the demand it is necessary to increase production
  - **Sales oriented (offer driven market)**
    - Demand < offer, it is necessary to raise the interest for the product
    - The salespeople must sell the product on the market
  - **Customer oriented (competition for the customers)**
    - „His/Her Majesty the Customer”
    - Creating products with respect to user demand
    - Catch the customers, built customer loyalty
    - Preferences, actions, loyalty programmes, etc.

Typical marketing combinations

Two major examples



Literature

The “bible” of marketing people

Philip Kotler – Kevin Lane Keller:

Marketing management

Pearson Higher Education, 2012

DISRUPTIVE AREAS

Innovation, products and sales

Big Bang disruption

The innovator

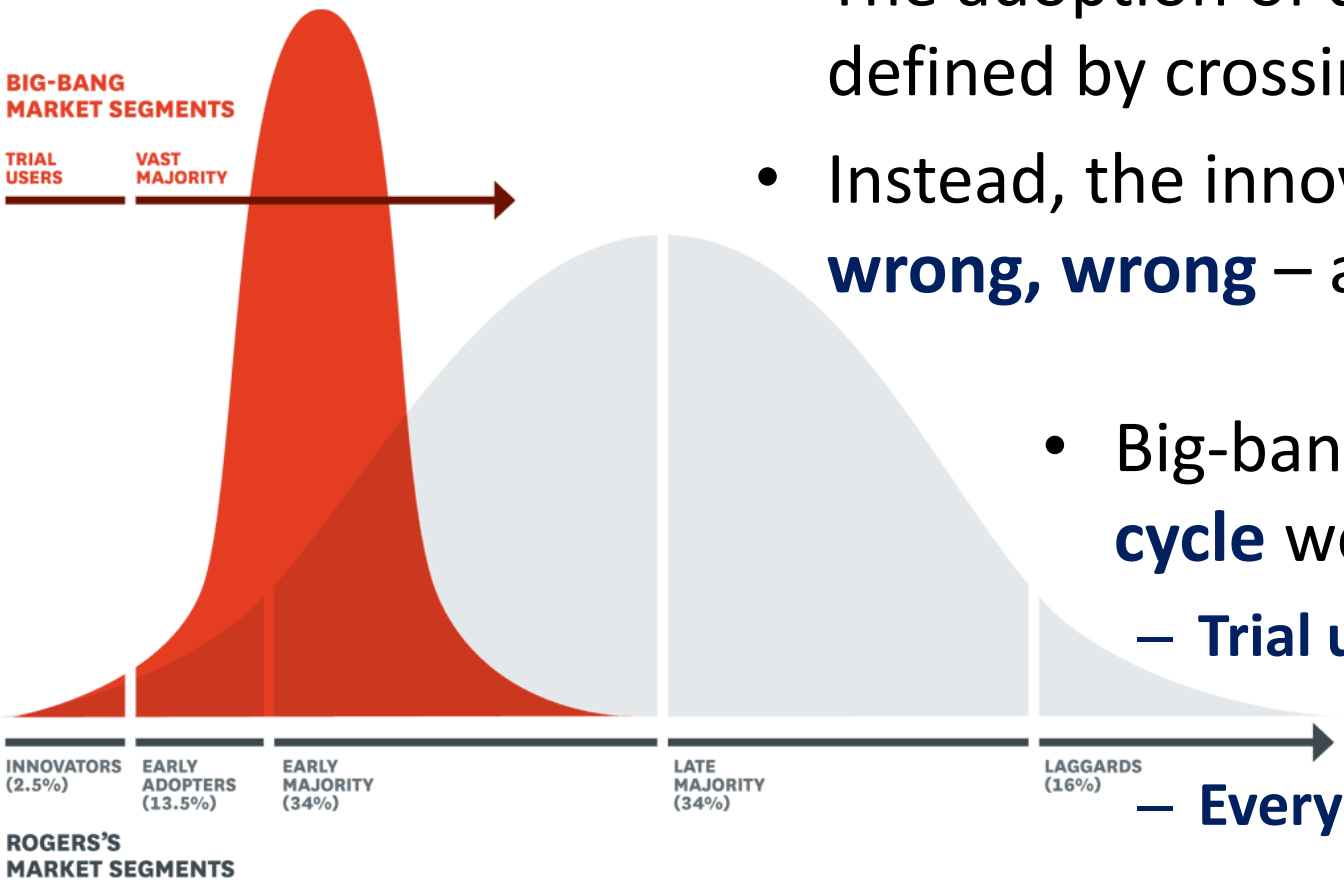
- Old-style disruption posed the **innovator's dilemma**

- Big-bang disruption is the **innovator's disaster**
  - The innovators who create products at "**hackathons**" aren't even trying to disrupt your business
  - **You're just the collateral damage**

Source: Big-Bang Disruption *by Larry Downes and Paul F. Nunes*; HBR, March 2013

Big Bang disruption

Unconstrained growth

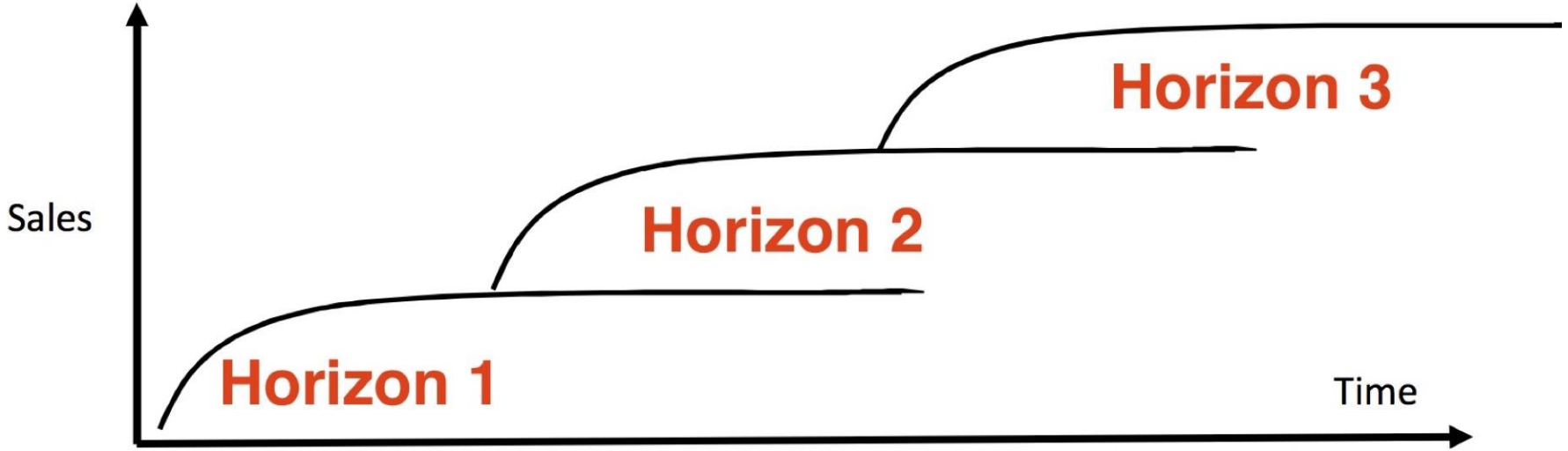


- The adoption of disruptive innovations is no longer defined by crossing a marketing chasm (EA – EM)
- Instead, the innovators collectively get it **wrong, wrong, wrong** – and then **unbelievably right**

- Big-bang disruptions collapse the **product life cycle** we know. There are only two segments:
  - **Trial users**, who often participate in product development, and
  - **Everyone else**

Source: Big-Bang Disruption *by Larry Downes and Paul F. Nunes*; HBR, March 2013

Three horizons of innovation (1/2)

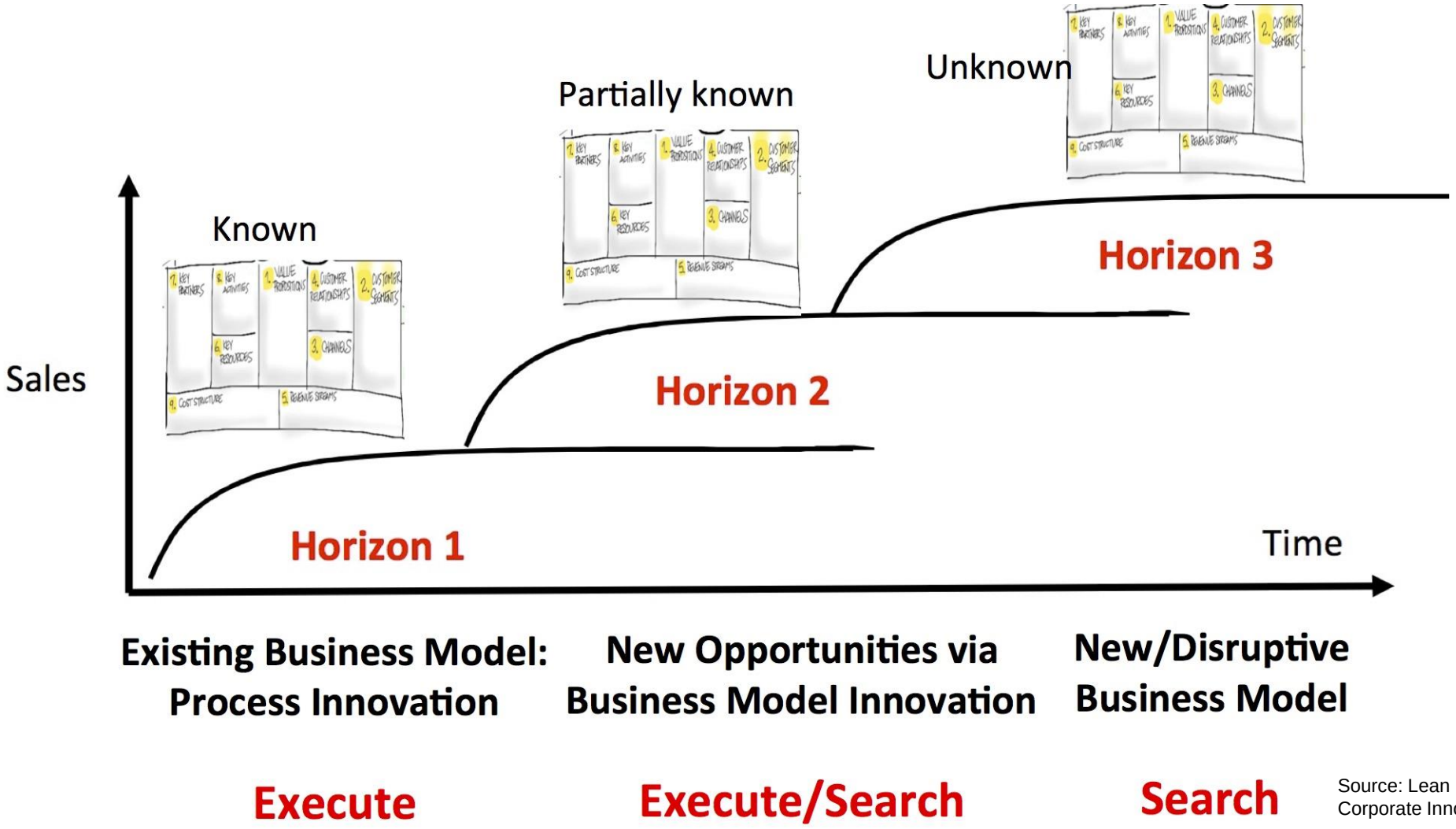


	Mature Business	Rapidly Growing Business	Emerging Business
Focus	Executing to defend, Extend, and increase Profitability of existing businesses	Resourcing initiatives to build new businesses	Uncovering options for future opportunities and placing bets on selected options
Output	Annual planning and forecasting; Detailed plans for growth through adjacencies	Business building strategies: investment budget, detailed business plans for new ventures	Decisions to explore: initial project plan, project milestones

Source: Lean Innovation Management – Making Corporate Innovation Work *by Steve Blank*

Source: Baghai, Coley, White

Three horizons of innovation (2/2)



Source: Lean Innovation Management – Making Corporate Innovation Work *by Steve Blank*

THANK YOU FOR YOUR ATTENTION!

Engineering Management BMEVITMMB03
BME Faculty of EE &IT MSc Majors
Economic & human themes

Knowledge Management

Zsuzsanna Kósa PhD

BME Dept. Telecommunications and Media Informatics

Budapest, spring of 2018

Types of knowledge

Tacit knowledge

- Personal knowledge
- Based on experiences
- Know-how
- Not tangible

https://www.samatters.com/intuition-come/

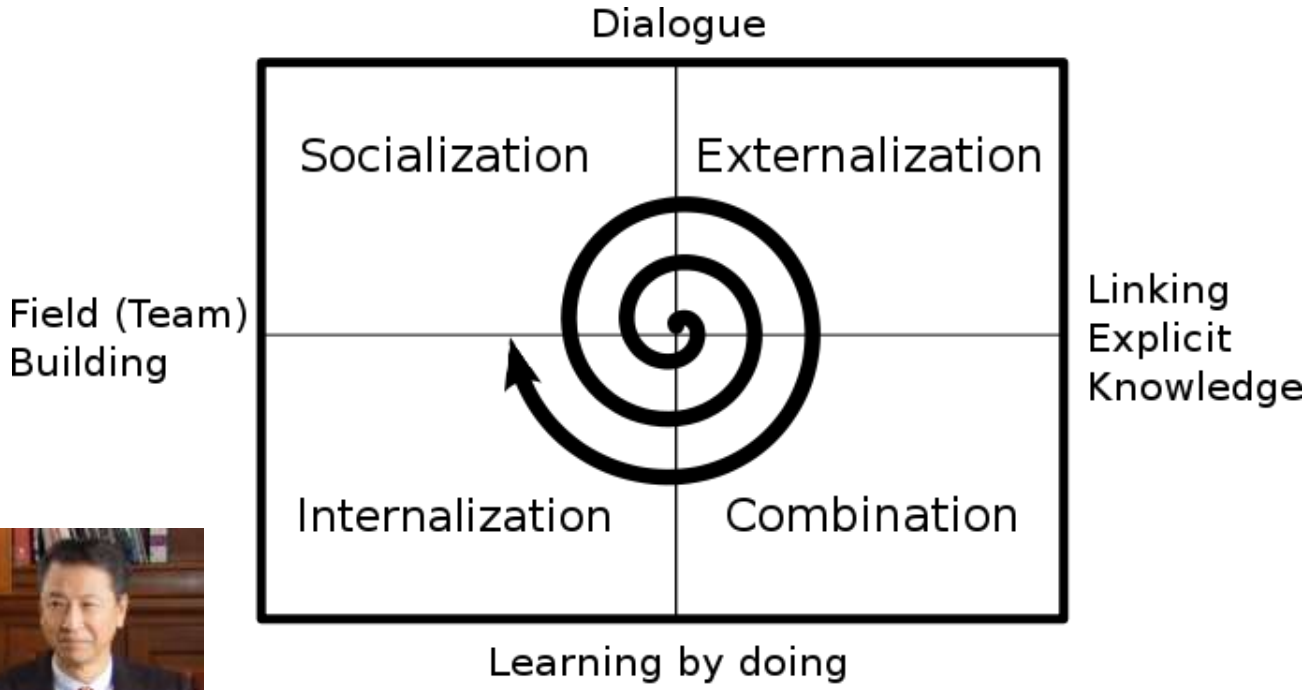
Explicit knowledge

- In forms
- Structured
- Coded
- Can be described
- Can be transmitted easily

Knowledge conversion - process interaction

from \ *to*	**Tacit**	**Explicit**
Tacit	***Socialization*** *master – servant* *parent – children* *learning by doing*	***Externalization*** *management handbooks,* *report on professional meetings*
Explicit	***Internalization*** *learning with action* *diagnosis based on internalized information of doctors*	***Combination*** *education in university* *paper co-authoring*

Knowledge conversion



Published by Nonaka & Takeuchi in 1995
http://www.12manage.com/methods_nonaka_seci.html

Knowledge Management (KM)

KM is an approach used in an organization

- to identify, create, represent, distribute, and enable adoption
- of knowledge (insights and experiences)
- for business aims.

https://eternalsunshineoftheismind.wordpress.com/2013/03/10/the-many-different-types-of-information-system-continued/

Main approaches of Knowledge Management

Codification Reuse of documented knowledge (systematization)

The knowledge is stored in databases, codificated, easily accessible, retrievable. (Tacit – Explicit – Tacit)

Personalization Reuse of colleagues' knowledge (relationships)

The knowledge is joint to its bearer, the main priority is to support the cooperation among persons via channels. (Tacit – Tacit)

Comparison of KM approaches

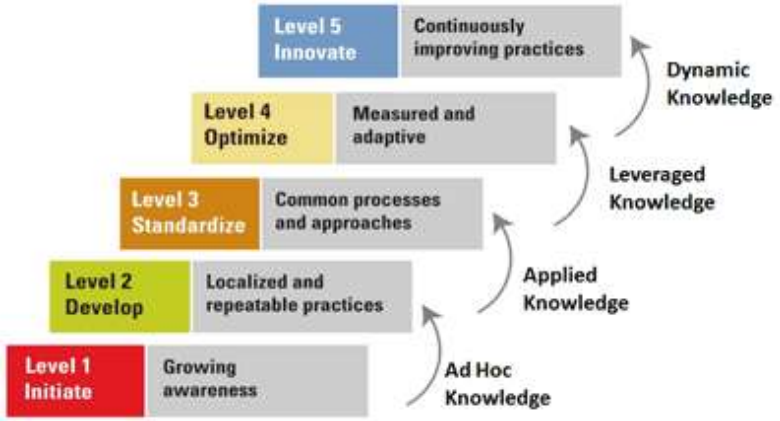
Codification

- Improvement the methodology
- Large IT investment
- Electronic document management system
- Reward the databases user

Personalization

- Hire good experts
- Small IT investment
- System for interconnection of persons, where tacit knowledge can be shared
- Reward the direct knowledge sharing

***Both:* Knowledge is asset, we need to spend on it**



https://www.apqc.org/membership-type-knowledge-management

Codification

- Aim is to form the organizational knowledge in order to be accessible for other persons, i.e. it can be shared. (e.g. law storage CD)
- Furthermore: can be stored, modified, handled with more mode.
- Possible techniques :
  - Map
  - Description (e.g. rules)
  - Classification
  - Modeling

http://www.tutorialspoint.com/knowledge_management/knowledge_management_strategy.htm

- What is the purpose of the knowledge? (e.g. consumers)
- Identification of knowledge (which can be bound to the aim?)
- Valuation of knowledge from usefulness point of view
- Choosing the appropriate tool for recording

Features of knowledges in codification process

Tacit knowledge

- cannot be learnt directly
- unstructured
- hard to observe
- complex
- not documented

Explicit knowledge

- can be learnt directly
- structured
- observable
- schematic
- simple
- documented

http://sharepointknowledgebase.blogspot.hu/2012/10/knowledge-management-with-metadata-and.html#.Vw-L1KH6b9I

Knowledge Mapping

- Nodes can be documents, databases, persons.
- Knowledge sources can be easier reached by a good knowledge map.
- This is not only inventory, but this shows the path to them.
- Organization structure is NOT Knowledge map.

- Questionnaire, in which can be read lots of question about
  - personal knowledge
  - which persons will be asked to help
- Large map can be assembled from many little knowledge maps.

https://thesupermemoblog.wordpress.com/2010/06/05/formulating-knowledge-mindmap-revised/

Example of knowledge mapping

1. working out the types and levels of competencies
2. each job has to be rated in terms of the knowledge competencies required to perform it
3. workers are also evaluated in terms of the knowledge
4. entries of the workers' competencies into the on-line system
5. developing the knowledge model

1. Define competency levels and types

Competency levels

- Foundation level: *with fundamental knowledge*
- Local or unique competency level: advanced skills that apply to a particular job type
- Global level, which applies to all employees within a particular function or organization
- Universal competencies for all employees in the company.

Competency types

Explicit: e.g. Excel, SQL

Implicit: involves more abstract thinking and reasoning skills.

Within each type of knowledge competency there are also four defined skill levels:

- *basic*
- *working*
- *leadership*
- *expert.*

Knowledge Mapping example continuation

2. Define the knowledge required for particular jobs

3. Rate the performance of individual employees in particular / in their current jobs by knowledge competencies.

4. Prepare on-line knowledge map for the mangers

5. Use and develope the model for building new projects

Individual and embedded knowledge

Risks:

- Persons with knowledge may leave the firm
- The skilled staff may ask for more

Embedded knowledge:

- Independent of creators
- Stabile in organization

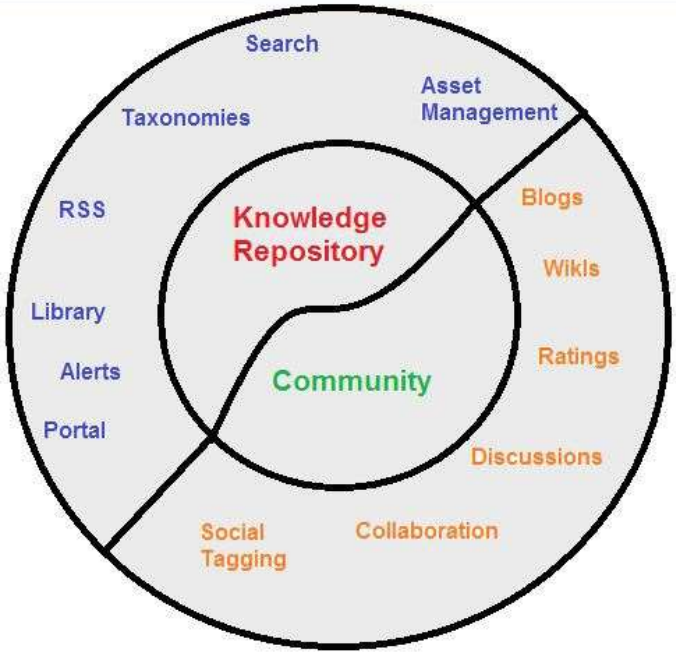
It is not easy to distinguish individual (embodied) and embedded knowledge, because

- *Both are present and work in the organization,*
- *But individual knowledge may leave easily from the organization*
- *There is no slavery anymore ☺☺☺*

Two ways for knowledge transfer

With information

- Transmits the information
- Independent from individuals
- Static
- Rapid
- Codificated
- Easy to deliver



Traditional

- Transmits the ability
- Dependent from individual
- Dynamic
- Slow
- Not codificated
- Hard to deliver

https://ridwanattaufiq.wordpress.com/2012/09/11/knowledge-management-system-in-company-as-implementation-business-strategy/

Modes of knowledge transfer

- Work relationships
- Delegation
- Labor works
- Trainings
- Professional referrals
- Usage of intellectual products

https://renigorman.wordpress.com/2010/09/19/recommendations-for-future-research-knowledge-management-and-microblogs-in-the-workplace/

Barriers of knowledge transfer *and possible solutions*

Lack of trust => *organize personal meeting*

Different culture, vocabulary=> *build mutual base with discussion, education*

Lack of time, place => *use conference speaking*

Award only for knowledge => *establish stimulating system for knowledge sharing*

Lack of reception ability => *motivate people to be open for new ideas*

Hierarchy at knowledge source => put higher quality value of thought than knowledge source

Intolerance of mistakes and questions => stimulate cooperation and understanding of lacks

Sides & features of knowledge transfer

Forward side - provide the knowledge

Velocity : How quickly transmits the information?

Reception side

Trust in source

put own pride in pocket

(+action) knowledge is not equal to action

Viscosity

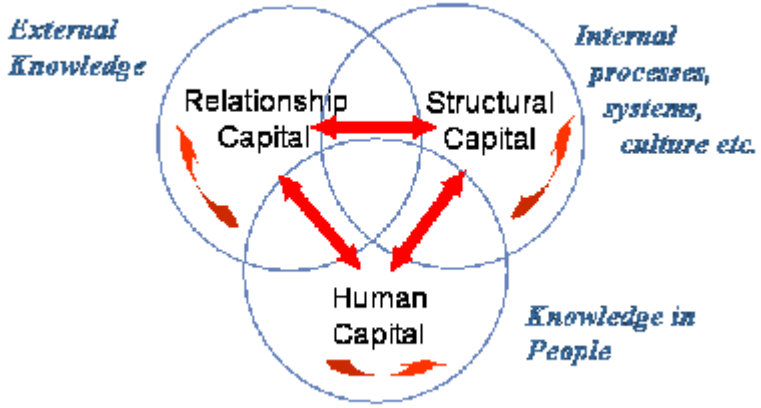
How much can he/she receive, how much does he/she apply?

Show the complexity of knowledge

http://ocmis.blogspot.hu/2013/04/managing-knowledge.html

Knowledge based enterprises

- ✓ Employees are well qualified experts
- ✓ They create knowledge by own competency
- ✓ Immaterial goods are more valuable than material goods



Capital Structure:

Visible capital: material goods

Immaterial goods:

- ❖ Outer structure: suppliers' and customers' relationships
- ❖ Inner structure: organizational structure and management of the enterprise, culture, R+D
- ❖ Individual competency: qualification, experience

http://www.skyrme.com/kmbasics/ic.htm

Modes of knowledge acquisition

- Development
- Purchase (organization or person)
- Leasing, renting (support of research institutes, apply of advisors)
- Development of a mixed group – experts with different knowledge and experience
- Knowledge network – self-organizational groups in the organization

http://www.picshunger.com/quotes/quotes-about-knowledge/

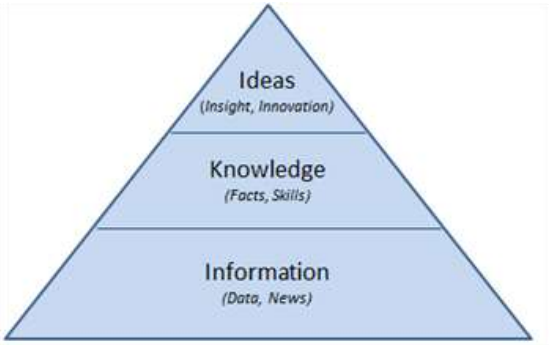
Strategies of knowledge based enterprises

Strategy focusing on information based on development of **information technology**

- Aiming the mass-market
- No possibility for customization
- Staff members are considered as costs

Strategy focusing on information based on **immaterial goods**

- High level of customization
- Staff members are considered as source of income



http://en.community.dell.com/dell-blogs/direct2dell/b/direct2dell/archive/2013/09/04/designing-a-successful-knowledge-management-strategy

Indicators of a knowledge management project

Increasing of human- and budget-resources

Increasing of knowledge content (accessible documents, participating persons)

Increasing of initiatives & activity (more persons per project)

Financial return (omit telephone talks, decreasing the cycle time of process, decreasing the waiting time of customer service)

https://louisdietvorst.wordpress.com/2011/12/16/from-key-performance-indicator-to-key-information-performance/

Power factors of knowledge organization

Published by Sveiby
http://www.gurteen.com/gurteen/gurteen.nsf/id/karl-erik-sveiby

Expert competency

Organizational competency

Expert	**Chief**
Supporting staff	**Manager**

Attributes of expert's behavior

- *Experts* like complex problems, freedom in research, new results, and mainly work alone.
- *Experts* are averse from restriction, routine works, bureaucracy.
- *Experts* do not care of salary, holidays, organization, experts of other areas.
- *Experts* lead rarely enterprise.
- *Experts* admire larger experts.
- *Experts* do not like (sometime hate) power oriented leaders.

Attributes of manager's behavior

- *Managers* lead the organization towards to aim with given resources and framework.
- *Managers'* task is to control of other persons' work.
- *Managers* like working together with different persons, they like to organize.

Note:

- *In knowledge organizations only few functional managers work, here expert's knowledge is also needed*

Knowledge manager's tasks

- ✓ Popularize the knowledge and learning.
- ✓ Plan and manage the knowledge infrastructure (library, database, knowledge networks, research centres, knowledge providing units)
- ✓ Keep contact with outer knowledge sources (university, database supplier).
- ✓ Acquire knowledge creating factors (development of new product, market research, work out the business strategy).
- ✓ Plan and manage the knowledge codification.
- ✓ Estimate the value of the knowledge.
- ✓ Develop the strategy dealing with knowledge.

Attributes of supporting employee's behavior

- They help with work of experts and managers.
- They have no special qualification.
- Their organizational and expert competency is low.
- They are helpful, but they should be stimulated.

Attributes of chief's behavior

- Chief's organizational and expert competency should be high.
- Chief's profession is the same, as experts' one, but no need to be the best or excellent expert.

  „The foolish is brighting, the wise is brighting less"
- Chief should know the aim.
- Chief's other attributes:

  steadiness,

  communication ability,

  empathy & altruism

Comparison of codification (CA) and personalization (PA) approaches

Added value for customer

CA: quickness in services, trustable and high quality products, at lower price

PA: personalized, high expert quality in products, unique projects

Source of profit

CA: cost effectiveness of reusing the existing information

PA: improve profitability through personalized innovative solutions

Human resource management

CA: executors are welcome, the aim is the increasing the effectiveness

PA: Innovators are welcome, on-the-job training and mentoring

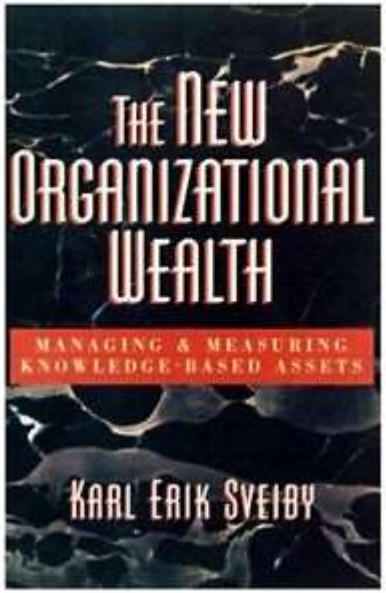
Tasks for knowledge management department

- Develop knowledge map
- Create a competency management system
- Elaborate the document management system
- Work out the customer information system
- Work out your own methodology
- Develop the system (innovation)
- Build intranet for knowledge sharing
- Organise knowledge community
- Evolve evaluating system of employees

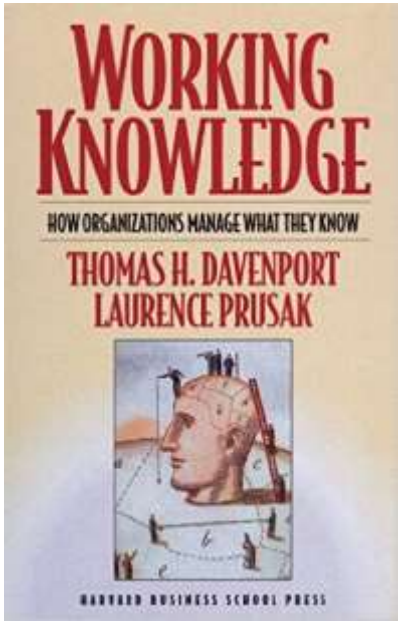
Areas of knowledge management

INFORMATION comes	SOFTWAREs are used
From customers	CRM, data warehouse, Internet
From suppliers	Inter- intranet, document management
From own products and services	Intranet, document management
From competitors	Internet, document management
From employees	Intranet
From regularization	Inter- intranet, document management
From methods and processes	Inter- intranet, document management Workflow management

Books on Knowledge Management



https://www.amazon.com/New-Organizational-Wealth-Measuring-Knowledge-Based/dp/1576750140?SubscriptionId=AKIAILSHYYTFIVPWUY6Q&tag=duckduckgo-d-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=1576750140



http://www.amazon.com/Working-Knowledge-Thomas-H-Davenport/dp/1578513014

Engineering Management BMEVITMMB03

BME Faculty of Electrical Engineering and Informatics MSc EE and IT Majors

Economic & human themes

CUSTOMER RELATIONSHIP MANAGEMENT (CRM)

László Kunsági

BME Dept. of Telecommunications and Media Informatics

Budapest, spring of 2018

What is Customer Relationship Management (CRM) ?

What is its *subsistance*?

Why is CRM *strategically* relevant?

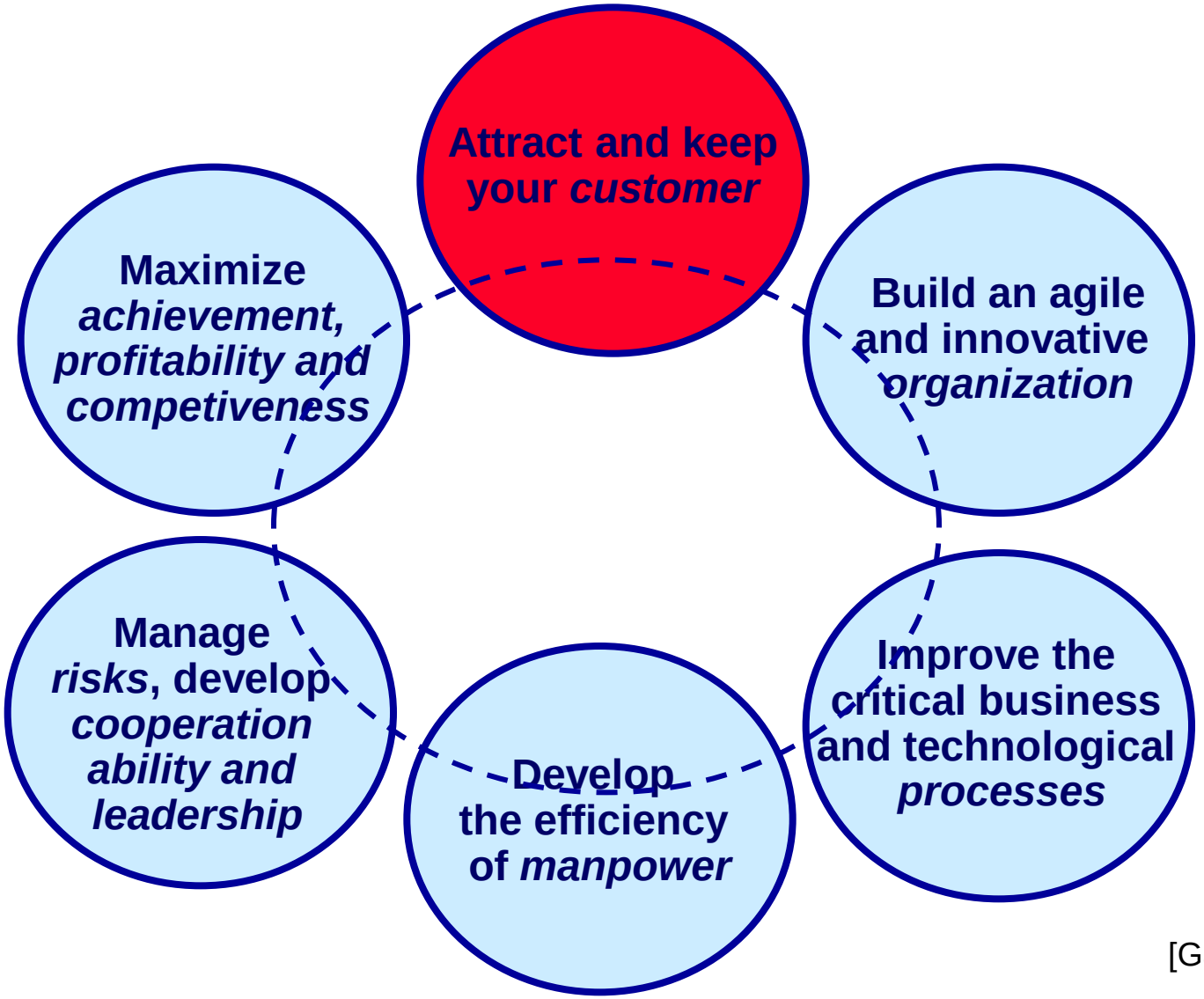
***When* is it worth applying CRM?**

Definition of CRM

- **Business strategy** proposed **to optimize** the income, operation cost, business profitability and **customer satisfaction**. (Gartner)

- To implement CRM, introduction of **business approach, processes and technologies** is needed to **support *coordinated* customer interactions** through all customer relation channels.

Mandatory business priorities of managers



[Gartner]

MARKET ENVIRONMENT OF THE ENTERPRISES

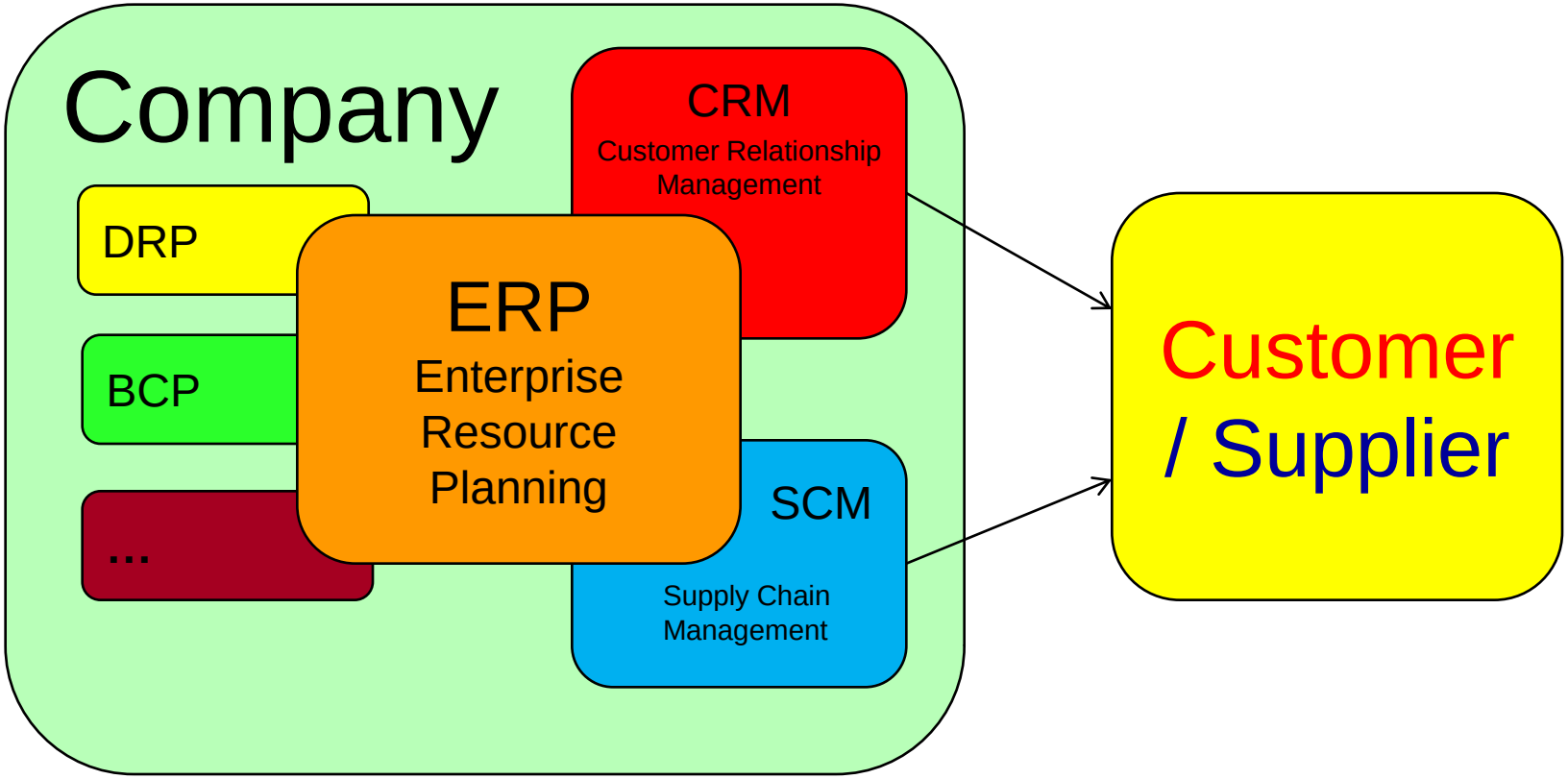
Typical *stakeholders* influencing the enterprises, their operation and results:

- Customers (demand, shopping power)
- Owners (state, private, national, multinational firms)
- Suppliers (offers, bargaining position)
- Competitors (threats, alliances)
- Cooperative business partners (alliances, subcontractors)
- Employees (knowledge, capabilities, attitude, atmosphere)
- R&D&I organizations (development opportunities)
- Financial organizations (financing, insurance)
- Administration (ministries, authorities, local governments)
- Media (press, R&TV, Internet, PR)
- Professional organizations (national, international, standards, representatives)
- Political parties (lobby)
- Consulting companies (head-hunters, marketing, organization…), and others

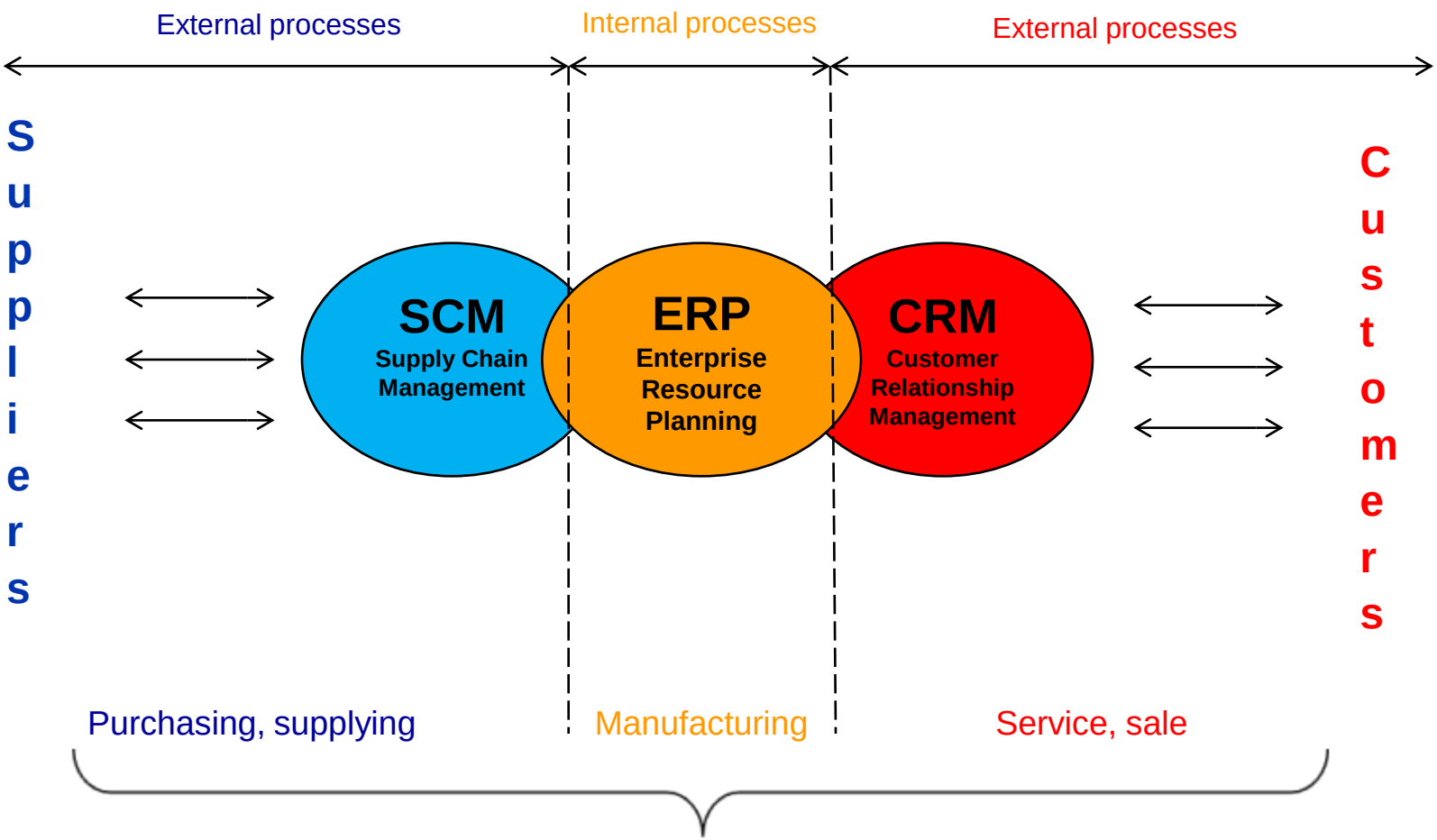
The enterprise influences its environment by **its own products.**

Product (hardware, software, services): can be bought on the market and generates benefits for the customer.

Role and position of CRM in a company



Processes spanning over the company

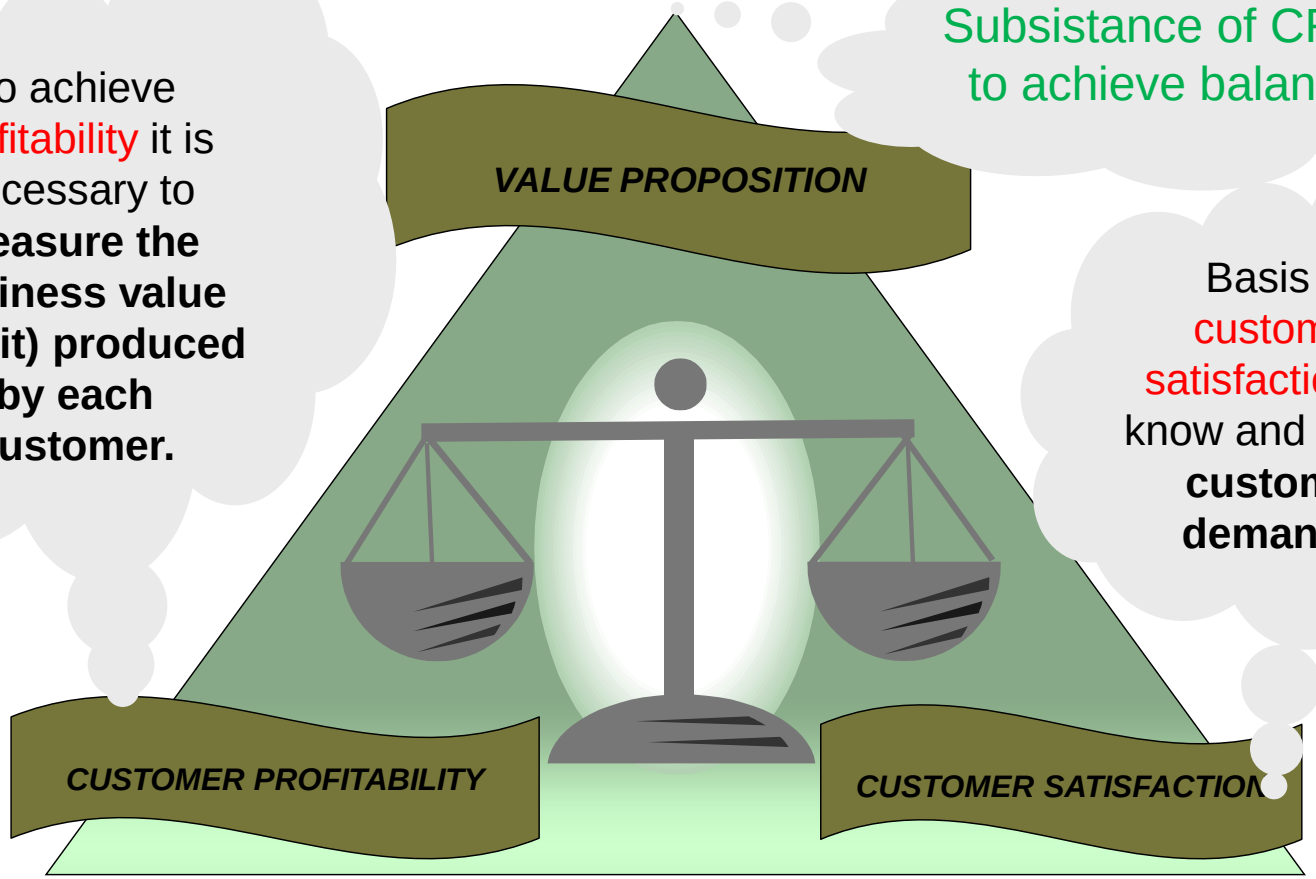


Extended ERP

Subsistance of CRM

Subsistance of CRM:
to achieve balance

To achieve profitability it is necessary to **measure the business value (profit) produced by each customer.**



Basis of customer satisfaction: to know and satisfy **customer demands.**

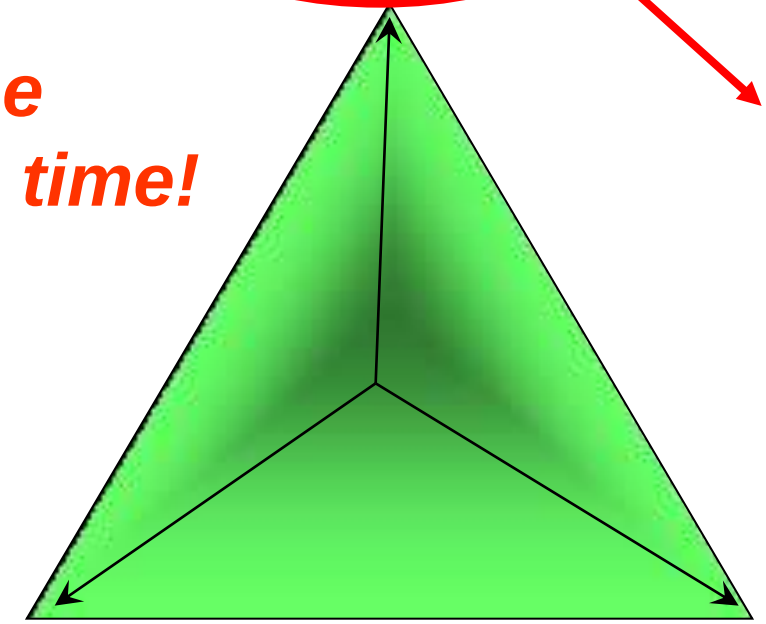
CRM strategy – to achieve competitive edge

Customer satisfaction

through **understanding and satisfying *personal* customer demands**

CRM strategy

Only one at the same time!



Product leadership

through development, introduction and sale of the **most innovative products**

Operational excellence

through producing and selling the **standard products in the cheapest and most efficient way**

Change of approach: from product-orientation to customer-orientation

How can we sell a product

- to more and more customers,
- as expensively as possible,
- of the lowest possible cost.

How can we identify a future customer and recognize his/her attitude to sell him/her the most possible products

- to satisfy the customer,
- as expensively as possible,
- of the lowest possible cost.

An everyday CRM solution

In a small grocery store:

- present market situation: **saturated market**, there is **no way to agressive competition in price**
- **critical objective: customer satisfaction**
  - ✓ the shopkeeper knows the customers personally
  - ✓ customers consider not only the products but the „additional service”, too
  - ✓ customer segmentation
  - ✓ tailor-made services
  - ✓ tailor-made discounts, credits

This example should be modeled by big companies, too!

CRM in big companies

- **strategy** to increase the customer-values
- **collection information** on customer habits available at the time of customer interaction (sale)
- **coordinated customer interactions** through different channels
- **decision making** during customer interactions
- **measurement** of customer satisfaction and value

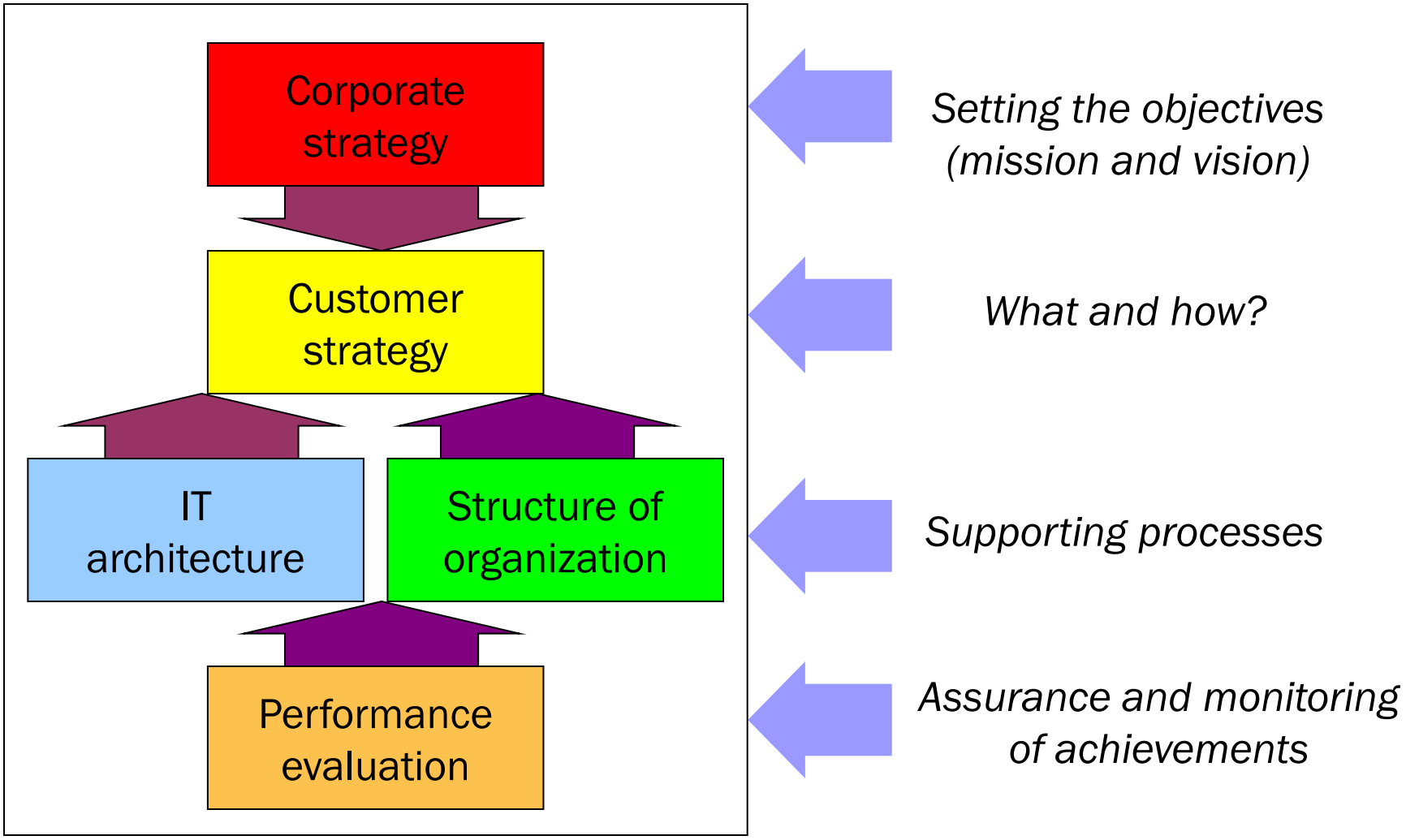
By introduction of IT supported applications!

CRM as a tool to react to the challenge of competition

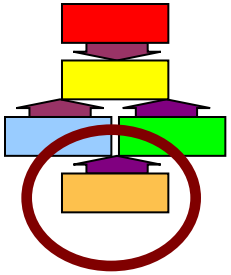
Type of reaction	Typical actions	Expected results
"Counter-challenge at all fields"	• Discounts in prices • Acquisition to regain the lost market share	Preserving the market share with increasing cost level ⟶ losing profit
"Selective counter-challenge"	• *Customer value* is critical in business decisions • Utilization of opportunities during the *whole customer life-cycle*	• Strengthening the leading position in the most profitable segments • Preserving the market share
"Doing nothing"	Preserving relatively high prices and high costs	Losing market share and profit

CRM strategy

Structure of CRM realization



Performance evaluation



Setting the aspects and methods of measurement of

- efficiency
- customer retention
- customer value

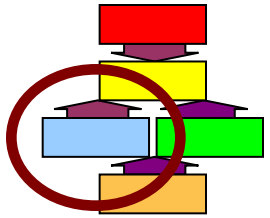
Balanced Scorecard Method (BSC)

- stakeholders aspect
- customer aspect
- value-chain aspect
- development aspect

Different indicators at different levels of the company

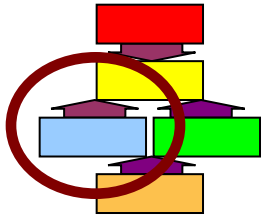
- corporate level
- division/business unit level
- employee level

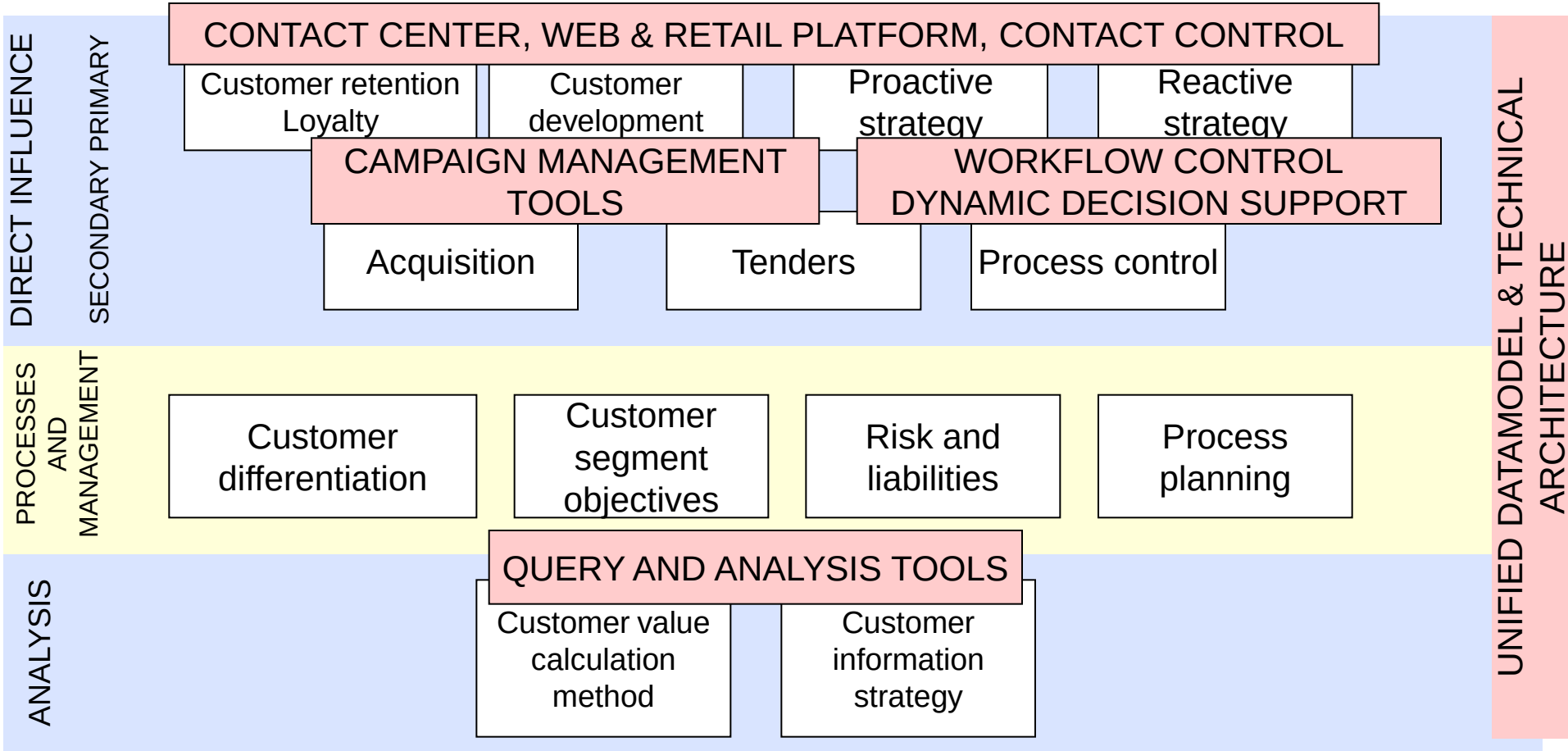
Supporting the customer strategy by the IT architecture



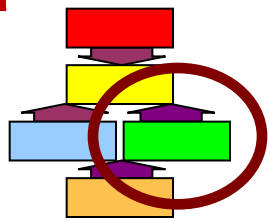
- OEM (off-shelf) product or our own development? Which platform?
- Complex system integration, relations of systems in a big enterprise environment
- Data resources, data services
  - Real-time CRM
    - ✓ Uptodate, „fresh” data
    - ✓ Problems in consistency
    - ✓ Simple customer service
    - ✓ Recommended if customer data change rapidly
  - „T+1” (delayed reaction) CRM
    - ✓ Data basically from data warehouse (DWH)
    - ✓ Consistent operation
    - ✓ Recommended if customer data change slowly, for supporting executive decisions
- Security requirements (managing user priorities, data security, reporting)

Supporting the customer strategy by the IT architecture (example)





Establishment of CRM-oriented organization and processes

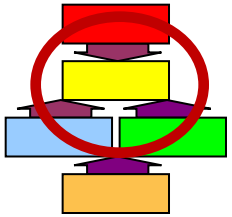


Organization and **processes** are key elements of the successful CRM projects.

Features:

- **CRM concept worked out and published** in the whole company properly
- **Managerial commitment,** coordinated business interest and operation
- Changing **corporate culture**
- Transition from function-based structure to **process and customer oriented** one
- **Processes through** divisions, departments and units
- Appearance of **segment managers**
- Establishment of **matrix organizations**

Customer strategy – shaping up segments



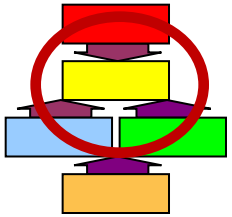
Aspects to shape up the segments

- Availability
  selected/shaped up market segments should be available by different marketing tools
- Being worthwhile
  the group should reach the „critical mass” (big enough), to work out specific tools to satisfy the demands. Not the size but the profitability matters!
- Identifiability
  customers should be recognizable/identifiable. How can we differentiate them during decision procedure?
- Customer value
  profit related to a certain customer

Further aspects can be

- Cross selling indicator
- Customer lifetime, customer loyalty
- Geographical regions
- Discipline in paying the bills (bonitas)
- Pricing (special [unique] prices, packages)

Customer strategy – shaping up segments (example)



Method to calculate customer value

Segmentation strategy (values and needs)

Segment plans

- Acquisition strategy
  - Campaigns
  - Tenders
- Service and billing strategy
  - Service levels
  - Billing service levels
  - Collection levels
- Customer development strategy
  - Tenders
  - Proactive campaigns
  - Assessment and qualification of relation
- Retention strategy
  - Tenders
  - Proactive campaigns
  - Loyalty programs
- Retrieval strategy
  - Tenders
  - Campaigns

„A" segment

„B" segment

„C" segment

Customer lifecycle management plan

- Signals and events
- Customer processes
- Campaigns

Partner segmentation

Partner Lifecycle Management Plan	Information strategy	Product and tender strategy	Risk management strategy	Competitor strategy	Customer process control

Customer-value oriented company?

A company is customer-value oriented if the following questions are responded:

- Who are our most valuable customers? Why?
- Who are our least valuable customers? Why?
- Who are our customers attracting most of the new ones (by spreading their positive experience)?
- Who are the candidates most probably becoming our new customers?
- Who are the candidates becoming our most valuable customers?

Summary of CRM

- Extended business strategy **optimizing customer satisfaction**, too
- Companies' **interface towards customers**
- **Balance between customer profitability and customer satisfaction**
- **Change of approach** from product-orientation to customer-orientation
- Proposed structure of **CRM realization**

Engineering Management BMEVITMMB03
BME Faculty of EE & IT MSc Majors
Economic & Human Themes

INTERNATIONAL ORGANIZATIONS IN TELECOMMUNICATION

István Gódor PhD & prof. Imre Abos & prof. Gyula Sallai

BME Dept. Telecommunications and Media Informatics

Budapest, Spring of 2018

Content

- Why do we need organizations for co-operations? (examples)
- Co-operations in telecommunication
- Concept and aim of standards
- International & European standardization organizations
  - ISO, IEC, ITU, CEN, CENELEC, ETSI
- Stakeholder organizations
  - UN, EC, WTO, OECD
- Technology specific and other organizations
  - IETF, oneM2M, GSMA, 3GPP, IMSO/INTELSAT/Eutelsat/INMARSAT, ETNO, EURESCOM, EBU, DVB, WorldDAB, DIGITALEUROPE/EICTA, ACM, IEEE

WHY DO WE NEED ORGANIZATIONS FOR CO-OPERATIONS?

Why are there so many plugs and sockets?

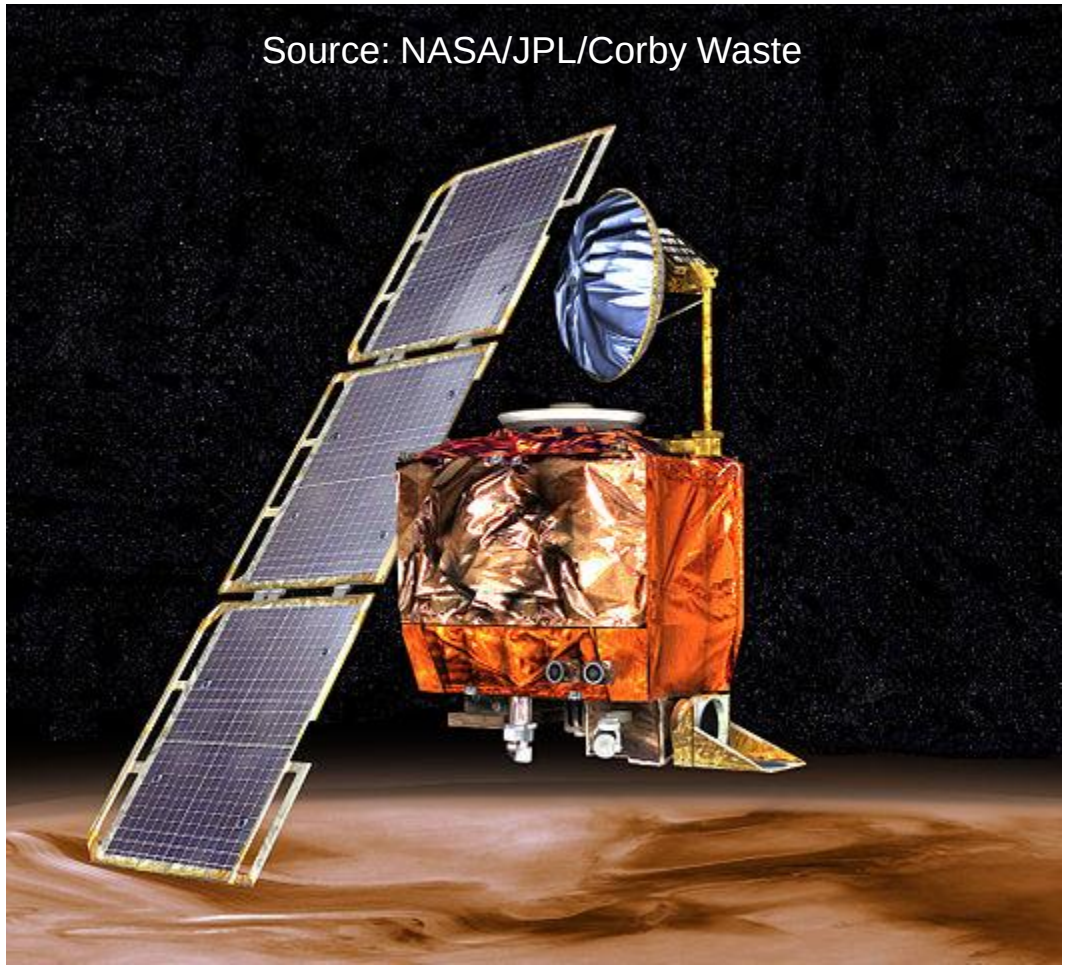
- The reason is historical: cross-border compatibility was not at the forefront of needs
  - Small percentage of people were travelling
  - Electric devices were generally not very portable
- **Standardization came too late**
  - World War II put a halt to all discussions and the issue was dropped until the 1950s
- Is there any hope for the future?
  - The IEC issued its International Standard for a universal plug in the 1970s
  - But literally hundreds of millions of plugs and sockets have been installed...

Source: http://www.iec.ch/worldplugs/why_so_many.htm

Can we have serious troubles?

- Metric mishap caused loss of NASA orbiter (1999)
  - "NASA lost a $125 million Mars orbiter because a Lockheed Martin engineering team used English units of measurement while the agency's team used the more conventional metric system for a key spacecraft operation, according to a review finding released Thursday.“

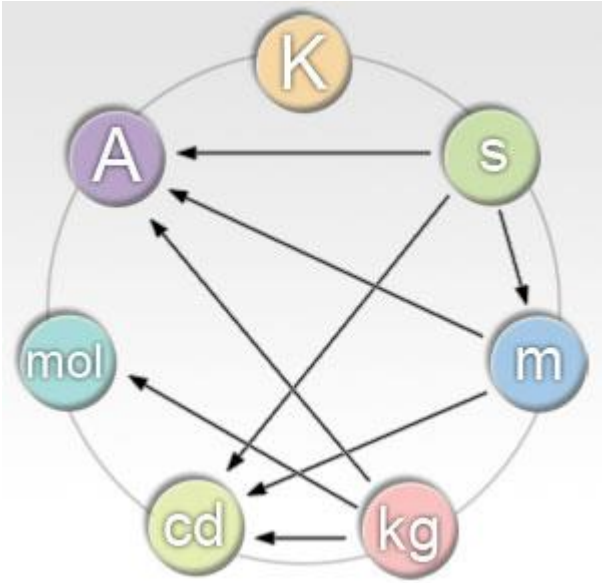
Traditions do not mean global compatibility



Source: http://edition.cnn.com/TECH/space/9909/30/mars.metric.02/

SI (International System of Units, Système international)

- The modern form of the metric system, and is the most widely used system of measurement
  - It comprises a coherent system of units of measurement built on seven base units (ampere, kelvin, second, meter, kilogram, candela, mole) and a set of twenty decimal prefixes to the unit names and unit symbols that may be used when specifying multiples and fractions of the units
  - The system also specifies names for 22 derived units for other common physical quantities like lumen, watt, etc.



The SI base units and their interdependency

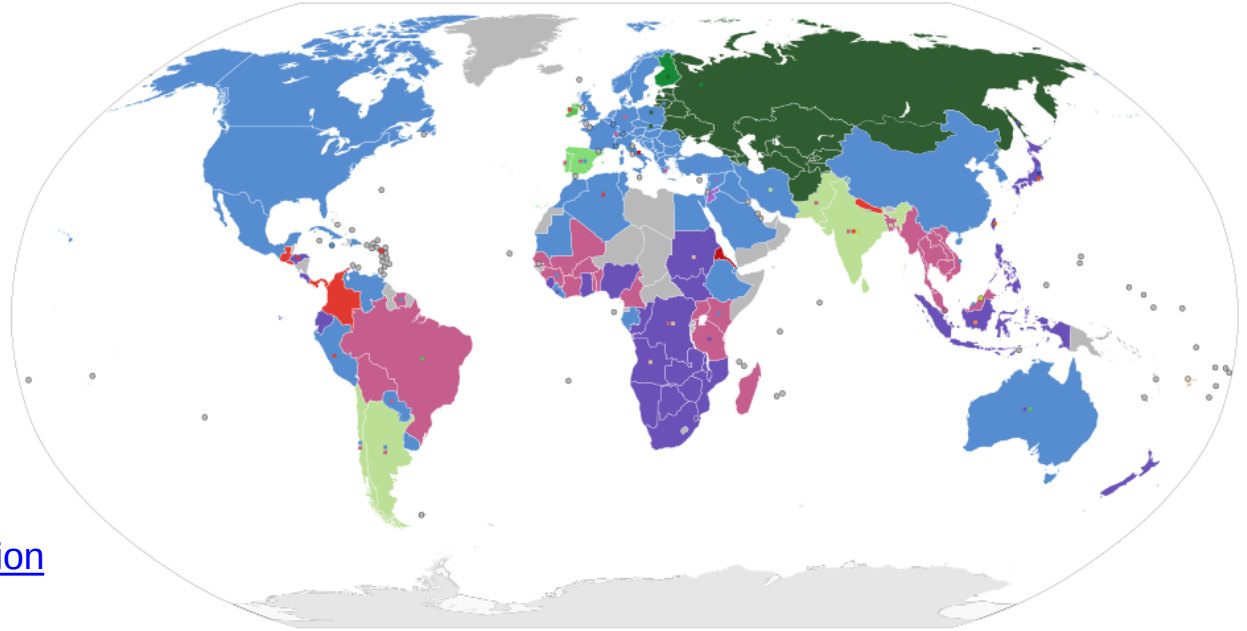
Symbol	*Name*	*Quantity*
A	ampere	electric current
K	kelvin	temperature
s	second	time
m	meter	length
kg	kilogram	mass
cd	candela	luminous intensity
mol	mole	amount of substance

Source:
https://en.wikipedia.org/wiki/International_System_of_Units
http://www.iec.ch/si

Railways

- Two foot, 600 mm
- 750 mm, Bosnian, Two foot six inch, 800 mm
- Swedish three foot, 900 mm, Three foot
- Meter
- Three foot six inch
- Four foot six inch
- **Standard (1435mm)**
- 1520 mm, Five foot
- Five foot three inch
- Iberian
- Five foot six inch
- Six foot, Brunel

- International Union of Railways (UIC) founded in 1922
  - Harmonize and improve conditions for railway constructions and operations



Source: https://uic.org/1922-UIC-a-long-life-organisation
https://en.wikipedia.org/wiki/Standard-gauge_railway

CO-OPERATIONS IN TELECOMMUNICATION

The role of international co-operation (1/2)

- In the telecommunications the international co-operations play essential, dominant role:
  - Network connectivity, setup connection
  - Service interworking (e.g. roaming, local break out)
  - Technical compatibility (e.g., multi-vendor networks)
  - Harmonization of the use of resources
    - Radio spectrum, satellite positions, transmission capacities
    - Numbers e.g. country code (USA: 1, HU: 36, Serbia: 381)
    - Names e.g. .hu, .eu
  - Tariff accounting
  - Quality partitioning, etc.

The role of international co-operation (2/2)

- Because of **liberalization and convergence** the followings become more **complex**:
  - Many service providers even within a country (monopoly / incumbents → oligopoly market / pure competition)
  - Mobile virtual network operators (MVNOs)
  - Mobile number portability (MNP)
  - Networked interworking of computers
  - Compatibility of applications (versions)
  - Uniformity, security of business transactions (electronic signature)
  - Globalization: more and more organizations, etc.

Types of international co-operation (1/2)

- **Agreements, memorandum of understandings (MoU), contracts** (in given topics)
  - Special international co-operations of service providers
  - Bi/multilateral telecom agreements of countries, etc.
- **Standards, recommendations** (de facto / de jure)
  - Telecom standardization organizations
  - Internet standardization organizations
- **Agreements, regulations** (general, governmental, legal relevance)
  - Telecom specific world and regional organizations
  - Telecom ”sections” of international organizations

Types of international co-operation (2/2)

- The competence of the several international agreements, standards and regulations are different
  - They are built into the rule of law of each country depending on their content and the kind of agreement
- A standard is not obligatory, rather it is a self-imposed obligation to observe the rules
  - In multiple market player environment it is also an economic interest
- The standards or their parts can become obligatory by legal regulation (inserting to a law)
  - Note: standards are not just for compatibility, but for expected quality!

CONCEPT AND AIM OF STANDARDS

The concept of standard (ISO/IEC)

- A standard is created or approved by a **certified organization**,
- **accepted by public consensus of subject matter experts,**
- such a **technical document**,
- which refers to **activities** or their **results** and
- consists of such **rules, instructions** and **attributes**,
- which can be utilized **generally** and **repeatedly**,
- by its use the **ordering effect** is the **most favorable** within given circumstances.

Standards organization

- Such a **standards body**, which is
- recognized at **national, regional or international level**, and
- its main activity is the **development and acceptance of standards** available to the community.

Aim of standardization

- In order to **simplify the trade and technology exchange**
  - fitting and ability for interoperability of products and services;
  - more effective production, distribution and maintenance;
  - better product quality, unified testing methods.
- **Reaching consensus** (in technical solution, process, etc.) **among the players of the economy** (vendors, service providers, users, governments, etc.)
- The world/European level standard products and services mean **safety and guarantee** to the users in the world and Europe

Main areas of standardization in telecom

- Information technology (IT)
- Electronic components
- Telecom networks
- Radio communication
- Mobile communications systems
- Telecom CPE (customer premises equipment)
- Telecom cables and wires
- Connectors, switches
- Safety of IT and telecom equipment
- Electromagnetic compatibility (EMC)

INTERNATIONAL & EUROPEAN STANDARDIZATION ORGANIZATIONS

International organizations

- **ISO: International Standardization Organization**
  - Universal standardization organization (founded in 1947), except electricity, electronics
- **IEC: International Electrotechnical Commission**
  - Standardization organization for electricity and electronics (founded in 1906)
- **ITU: International Telecommunication Union**
  - Founded in 1865 as the International Telegraph Union, took its present name in 1934, and in 1947 became a specialized agency of the United Nations
  - ITU-T: Telecommunications Standardization Sector of ITU
  - ITU-R: Radiocommunication Sector of ITU
  - ITU-D: Telecommunication Development Sector of ITU

European organizations

- **CEN: Comité Européen de Normalisation**
  - European Committee for Standardization
  - The European equivalent of ISO (founded in 1961)
- **CENELEC: Comité Européen de Normalisation Electro-technique**
  - European Committee for Electrotechnical Standardization
  - The European equivalent of IEC (founded in 1973)
- **ETSI: European Telecommunication Standards Institute**
  - The European equivalent of ITU-T (founded in 1988)

ISO: International Standardization Organization

ISOFIX security
Source: Tetris L

- ISO is an **independent, non-governmental** international organization founded in 1947
- Members from 161 national standards bodies and 780 technical committees and subcommittees
- More than 135 people work full time for ISO's Central Secretariat in Geneva, Switzerland
- ISO has published 22136 International Standards and related documents, **covering almost every industry, from technology, to food safety, to agriculture and healthcare**
- ISO International Standards impact everyone, everywhere

ISO 9001 Quality Management
Source: TÜV

IEC: International Electrotechnical Commission

- IEC is a **not-for-profit, quasi-governmental organization**, founded in 1906, based in Geneva, Switzerland
- The IEC's members are National Committees (from 85 countries)
  - Experts and delegates coming from industry, government bodies, associations and academia
- **Recognized by World Trade Organization (WTO)**
  - Entrusted for **monitoring organizations** agreeing to use IEC's international standards as the basis for national or regional standards as part of the **WTO's Technical Barriers to Trade Agreement**

IEC 600086 Battery numbering
Source: Wikipedia

Decimal	SI	Binary	IEC
1000	k kilo	1024	Ki kibi
1000^2	M mega	1024^2	Mi mebi
1000^3	G giga	1024^3	Gi gibi
1000^4	T tera	1024^4	Ti tebi
1000^5	P peta	1024^5	Pi pebi
1000^6	E exa	1024^6	Ei exbi
1000^7	Z zetta	1024^7	Zi zebi
1000^8	Y yotta	1024^8	Yi yobi

ITU: International Telecommunication Union (1/6)

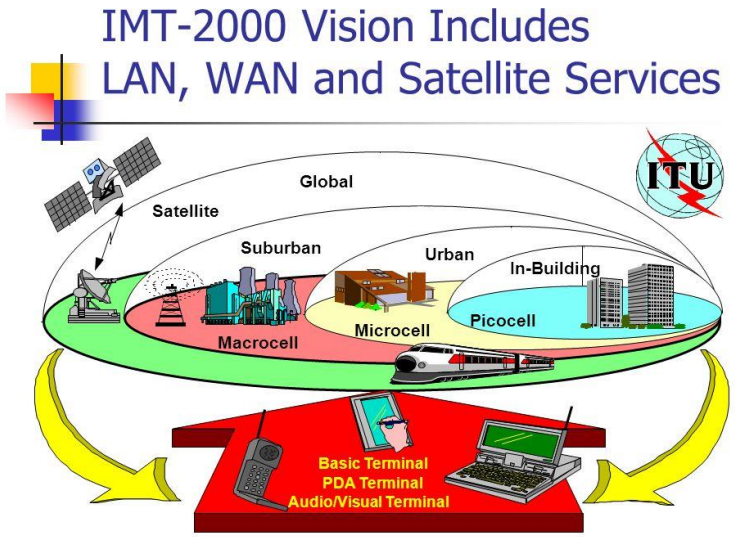
- ITU was founded in 1865 as the **International Telegraph Union**
  - Took its present name in 1934, being an overall telecom world organization
- ITU became the **United Nations specialized agency for information and communication technologies (ICTs)** in 1947, based in Geneva, Switzerland
- Mission is to **achieve the best practical solutions for integrating new technologies as they develop, and to spread their benefits to all**
- Works
  - **3 sectors: standardization (T), radiocommunication (R), development (D)**
  - Members: states (administrations), service providers, vendors, etc.
  - Governing documents: Constitution, Convention, Decisions, **Recommendations**, Position papers (Opinions)

ITU: International Telecommunication Union (2/6)

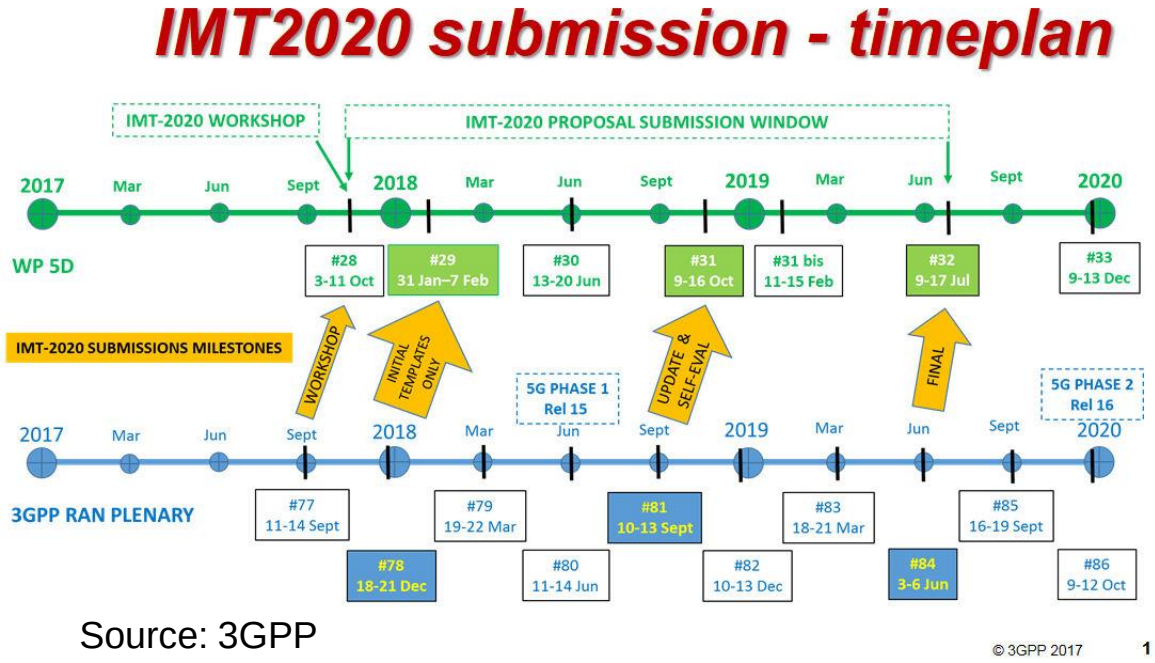
- **Telecommunication Standardization Sector (ITU-T)**
  - Standards are critical to the interoperability of ICTs, i.e., ICT networks and devices are speaking the same language
  - Standardization work is carried out by the technical Study Groups (SGs)
    - SG2 - Operational aspects
    - SG3 - Economic and policy issues
    - SG5 - Environment and climate change
    - SG9 - Broadband cable and TV
    - SG11 - Protocols and test specifications
    - SG12 - Performance, QoS and QoE
    - SG13 - Future networks
    - SG15 - Transport and access
    - SG16 - Multimedia
    - SG17 - Security
  - **Recommendations = international standards**: Networks (fiber/SDH, xDSL, IP, mobile, data, CATV…), switching, signaling, multimedia, telecom software, numbering, quality requirements (QoS), traffic sizing, tariff accounting, terminology, etc.

ITU: International Telecommunication Union (3/6)

- **Telecommunication Standardization Sector (ITU-T) /cont'd/**
  - Working Party 5D (WP 5D) - IMT Systems
    - WP 5D is responsible for the overall radio system aspects of International Mobile Telecommunications (IMT) systems, comprising the IMT-2000, IMT-Advanced and IMT for 2020 and beyond



Source: ITU & Ella Harper



Source: 3GPP

ITU: International Telecommunication Union (4/6)

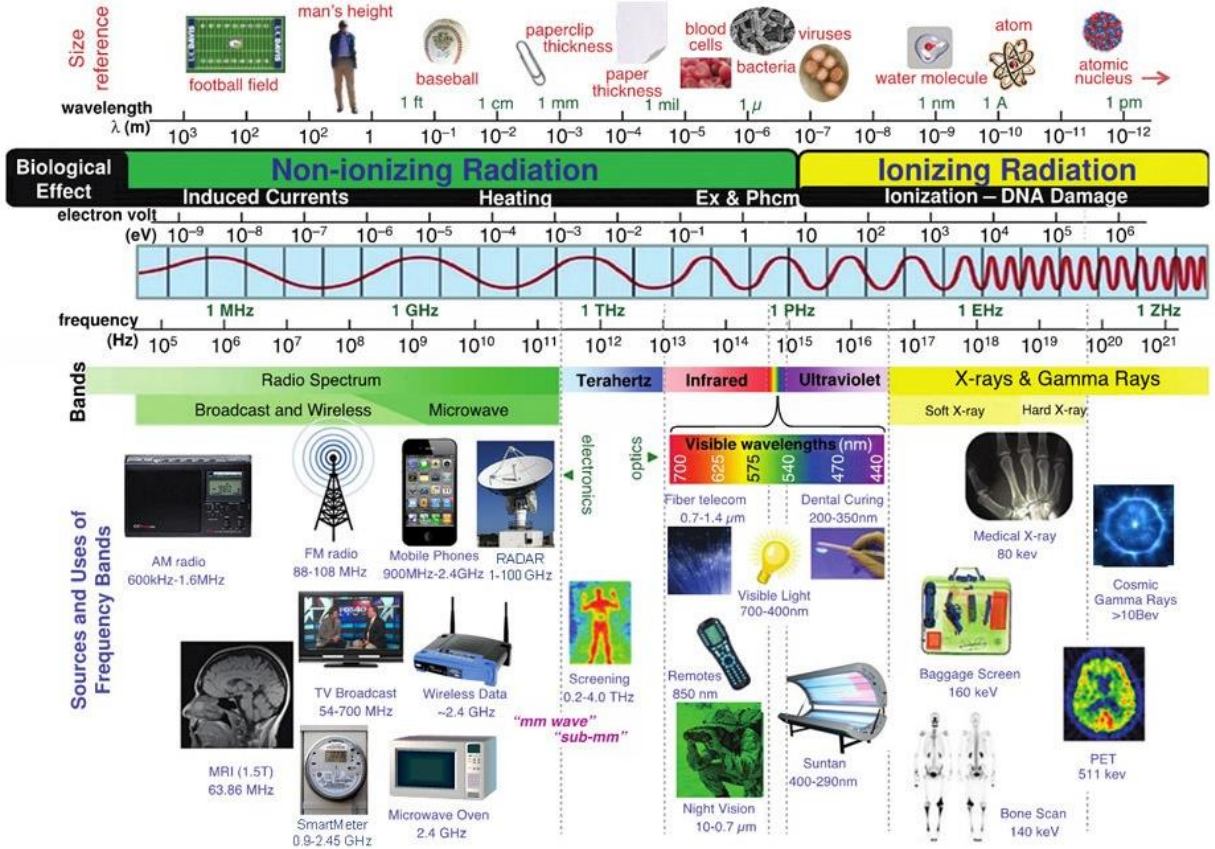
- **Radiocommunication Sector (ITU-R)**
  - Vital role in the **global management of the radio-frequency spectrum and satellite orbits** that ensure safety of life on land, at sea and in the skies
    - Limited natural resources which are increasingly in demand
  - Ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services
  - Carry out studies and approve **Recommendations on radiocommunication matters**
  - **World radiocommunication conferences (WRC)** are held every three to four years to **review, and, if necessary, revise the Radio Regulations**
    - Last: WRC-15, Next: WRC-19

ITU: International Telecommunication Union (5/6)

- **Radiocommunication Sector (ITU-R) /cont'd/**

Band	Abbr.	Frequency	Wavelength
4	VLF	3 kHz – 30 kHz	10 km – 100 km
5	LF	30 kHz – 300 kHz	1 km – 10 km
6	MF	300 MHz – 3000 MHz	100 m – 1000 m
7	HF	3 MHz – 30 MHz	10 m – 100 m
8	VHF	30 MHz – 300 MHz	1 m – 10 m
9	UHF	300 MHz – 3000 MHz	10 cm – 100 cm
10	SHF	3 GHz – 30 GHz	1 cm – 10 cm
11	EHF	30 GHz – 300 GHz	1 mm – 10 mm
12	THF	300 GHz – 3000 GHz	0.1 mm – 1 mm

Table of ITU radio bands



Graphic courtesy of Jerrold Bushberg. Reproduced with permission from The Essential Physics of Medical Imaging, 3rd edition, by Jerrold Bushberg et al. © Lippincott Williams & Wilkins, 2012.

ITU: International Telecommunication Union (6/6)

- **Telecommunication Development Sector (ITU-D)**
  - **Foster international cooperation** on telecommunication and ICT development issues
  - **Foster an enabling environment** for ICT development and foster the development of telecommunication and ICT networks
  - **Enhance confidence and security** in the use of telecommunication and ICTs
  - Build human and institutional capacity, provide data and statistics, promote digital inclusion and **provide concentrated assistance to countries in special need**
  - **Enhance environmental protection, climate change adaptation and mitigation and disaster-management efforts through telecommunication and ICTs**

CEN: Comité Européen de Normalisation

- Association that brings together the National Standardization Bodies of 34 European countries (founded in 1961, based in Brussels, Belgium)
- **Officially recognized by the European Union and by the European Free Trade Association (EFTA)** as being responsible for developing and defining voluntary standards at European level
- **CEN provides a platform for the development of European Standards** and other technical documents in relation to various kinds of products, materials, services and processes

EN 71: Safety of toys
EN 71-1: Mechanical and physical properties
EN 71-2: Flammability
EN 71-3: Specification for migration of certain elements
…
EN 71-6: Graphical symbols for age warning labelling
…
EN 71-11: Organic chemical compounds – Methods of analysis
…

CENELEC: Comité Européen de Normalisation Electro-technique

- CENELEC is a **non-profit technical organization** founded in 1973, based in Brussels, Belgium
- Responsible for standardization in the electrotechnical engineering field
  - Prepares **voluntary standards**, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a **Single European Market**
    - 2 major deliverables: the European Standard (EN) and the Harmonization Document (HD)
    - Must be implemented in all CENELEC member countries, who must also withdraw any conflicting standard
  - Creates market access at European level but also at international level, adopting international standards wherever possible, through its **close collaboration with the International Electrotechnical Commission (IEC)**

ETSI: European Telecommunication Standards Institute (1/4)

- ETSI is a **not-for-profit organization** with more than 800 member organizations worldwide, drawn from 66 countries and five continents (founded in 1988, based in Sophia-Antipolis, France)
  - **Members include the world's leading companies and innovative R&D organizations (national standards bodies, state administrations, service providers, vendors, research institutes, etc.)**
  - Condition of membership: official acceptance of ETSI standards
- Standardization work is carried out in **committees**
  - Members are technical experts from our member companies and organizations
  - Meet typically between two and six times a year

ETSI: European Telecommunication Standards Institute (2/4)

- **Committees and projects**
  - **Technical Committee (TC):** addressing a number of standardization activities in a specific technology area
  - **ETSI Project (EP):** established to meet particular market sector needs rather than centered around a basic technology
  - **ETSI Partnership Project:** established to co-operate with other organizations: **Third Generation Partnership Project (3GPP™) and oneM2M**
  - **Industry Specification Group (ISG):** focusing on a very specific activity
  - **Special Committee (SC):** like TCs, but SCs tend to handle co-ordination
  - **Specialist Task Force (STF):** intensive work of technical under the guidance of a TC or EP

ETSI: European Telecommunication Standards Institute (3/4)

- **Making standards in the topics of**
  - Voice communication and quality
  - Interconnection of networks and systems
  - Telecommunications network management,
  - Mobile standards
  - Satellite earth stations
  - Radio spectrum, health effects of the radiation
  - Services and protocols
  - Security (infrastructure of electronic signature)
  - Mobile trade
  - Smart cards
  - Environment protection
  - etc.

ETSI: European Telecommunication Standards Institute (4/4)

- ETSI's **standards-making process is based on consensus**
  - Only when consensus cannot be achieved is a vote conducted in a Technical Committee
  - **ETSI ES (ETSI Standard)**: accepted by the members,
  - **ETSI EN (European Standard)**: the accepted EN must be inserted to the system of national standards exclusively and without any modification.
- The **greatest success** of the European infocom standardization is the **GSM standard**

Development of European standards (1/2)

- **Main phases of making European standards**
  1. Initiative for new work item
  2. Designing the work item
  3. Phase of development
  4. Public consultation, call for contribution
  5. Revision of contributions
  6. Acceptance
  7. Introduction / publication

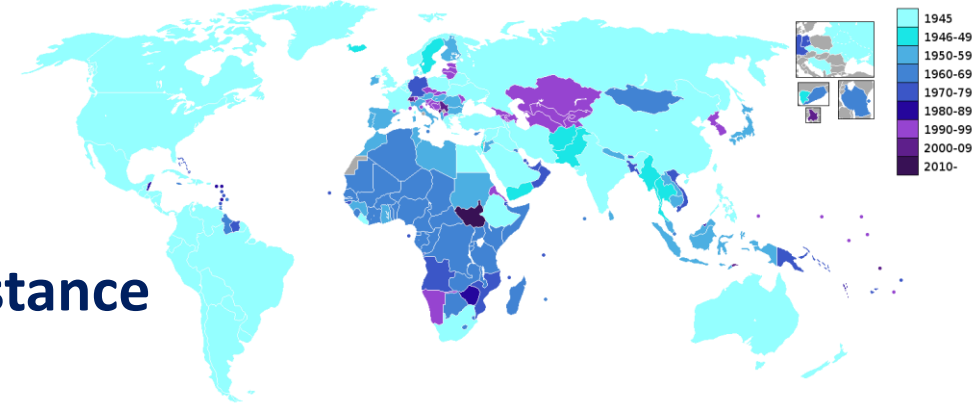
Development of European standards (2/2)

- **European Standards (EN):** ratified by one of the 3 European Standards Organizations, CEN, CENELEC or ETSI
  - “Carries with it the obligation to be implemented at national level by being given the status of a national standard and by withdrawal of any conflicting national standard."
- **Harmonization Document (HD):** is a normative document
  - The elaboration of a HD includes a public enquiry, followed by an approval by weighted vote of national members and final ratification
  - HD is announced at national level and every conflicting national standard is withdrawn
  - A HD does not conflict with any other EN and HD and is periodically reviewed

STAKEHOLDER ORGANIZATIONS

United Nations

- The United Nations is an international organization founded in 1945, based in New York City, USA
  - It is currently made up of 193 Member States
  - Further main offices are situated in Geneva, Nairobi, and Vienna
- Objectives
  - **Peacekeeping and security**
  - **Human rights**
  - **Economic development and humanitarian assistance**
- Telecom aspects
  - **Special agreement recognizing ITU as a UN specialized agency**



EC - European Commission (1/2)

- European Commission is **the permanent decision preparatory organ of the EU** (27 commissioners, 24 Directorates General, 12 offices), founded in 1957, based in Brussels
- **Directorate General Information Society and Media (DG INFSO)**, also helping the reform of the telecommunication sector, the development of competition and convergence
  - Preparation of the regulatory framework (directives and decisions) obligatory for all EU member states (decision: EU Council and Parliament)
  - R&D programs (e.g. ICT in the framework programs, PHARE)
  - Public consultative studies (Green books)

EC - European Commission (2/2)

- The DG INFSO developed a framework for the regulation of electronic communication of a package of 5 Directives and 2 Regulations
  - **Framework Directive:** common regulatory framework for networks and services
  - **Access Directive:** access to, and interconnection of, networks and associated facilities
  - **Authorization Directive:** authorization of electronic communications networks and services
  - **Universal Service Directive:** universal service and users' rights relating to electronic communications networks and services
  - **Directive on Privacy and Electronic Communications:** concerning the processing of personal data and the protection of privacy in the electronic communications sector
  - **Regulation on Body of European Regulators for Electronic Communications (BEREC)**
  - **Regulation on roaming on public mobile communications networks**
- The **EC can declare the application of given standards obligatory**, such as **GSM and DVB-H** (Digital Video Broadcasting for handheld)

WTO - World Trade Organization

- WTO is an **intergovernmental organization that regulates international trade, based in Geneva, Switzerland**
  - WTO officially commenced on 1 January 1995, replacing the General Agreement on Tariffs and Trade (GATT), which commenced in 1948
  - WTO supports the creation of discrimination free trade
  - General Agreement on Trade in Services (GATS)
    - The agreement was extended to the liberalized telecom services as well
- **IEC is recognized by World Trade Organization (WTO)**
  - Entrusted for monitoring organizations agreeing to use IEC's international standards as the basis for national or regional standards as part of the WTO's Technical Barriers to Trade Agreement

OECD - Organization for Economic Co-operation and Development

- OECD is an **intergovernmental economic organization** with 35 member countries (Hungary is a member from 1996), founded in 1961 to stimulate economic progress and world trade, based in Paris
- **Consultative institution**, producing analyses, studies, yearly status reports and other brochures
  - E.g., Gross domestic spending on R&D: https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm
- OECD uses its wealth of information on a broad range of topics to
  - Help governments foster prosperity and fight poverty through economic growth and financial stability
  - Help ensure the environmental implications of economic and social development are taken into account

TECHNOLOGY SPECIFIC AND OTHER ORGANIZATIONS

Internet (1/3)

IETF - Internet Engineering Task Force (1/2)

- **IETF is a large open international community** for the evolution of the Internet architecture and the smooth operation of the Internet, founded in 1986, based in Fremont, USA
  - **Open to any** individual, network designers, operators, vendors, and researchers
  - **Voluntary technical work in working groups (WG)** organized by topic into several areas (e.g., routing, transport, security, etc.)
  - Collaboration mostly via mailing lists, meetings three times per year
- **Example internet standards**
  - IP (STD 5, RFC 791), UDP (STD 6, RFC 768), TCP (STD 7, RFC 793), TELNET, ...
  - JavaScript Object Notation (JSON) Data Interchange Format (STD 90, RFC 8259)

Internet (2/3)

IETF - Internet Engineering Task Force (2/2)

- **Internet standard process a multi-step approval process**
  1. **Internet-Drafts** are working documents
     - During the development of a specification, draft versions are made available for informal review and comment by placing them in the IETF's Internet-Draft format
  2. **RFCs (Request For Comment)** to document methods, behaviors, research, or innovations applicable to the Internet
     - If an RFC is part of a proposal that is on the Standards Track, then at the first stage, the standard is proposed and subsequently organizations decide whether to implement this Proposed Standard (can be a concatenation of more than one RFC)
  3. **Proposed Standard**
     - After the criteria in RFC 6410 is met (two separate implementations, widespread use, no errata etc.), the RFC can advance to Internet Standard
     - Note: the intermediary step called Draft Standard was discontinued in 2011
  4. **Internet Standard**

Internet (3/3)

oneM2M

- **oneM2M** was launched in 2012 as a global initiative to ensure the most efficient deployment of Machine-to-Machine (M2M) communications systems and the Internet of Things (IoT)
  - Fourteen partners **including ETSI** and seven other leading ICT Standards Development Organizations (SDOs)
  - Representatives of different industry sectors (including telematics and intelligent transportation, healthcare, utilities, industrial automation, smart home)
- Process
  - Draft Technical Specifications
  - Ratified Technical Specifications, for example
    - oneM2M-TS-0001 specifies the functional architecture for the oneM2M services platform

Mobile com. organizations (1/5)

GSM Association (GSMA)

- **Originally European trade body** that represents the **interests of mobile network operators worldwide**
  - Approximately 800 mobile operators are full GSMA members and a further 300 companies in the broader mobile ecosystem are associate members
  - Events such as Mobile World Congress, Mobile World Congress Shanghai, Mobile World Congress Americas and the Mobile 360 Series conferences
- Main activities include programs and services, e.g.,
  - **TAC (Type Allocation Code) Allocation** only by the GSMA through their appointed reporting bodies
    - Device brand owners and manufacturers need TAC to create the first 8 digits of the International Mobile Equipment Identity (IMEI), the number that identifies each unique mobile device on all GSM networks

Mobile com. organizations (2/5)

3rd Generation Partnership Project (3GPP) (1/4)

- **3GPP unites telecommunications standard development organizations** (ARIB, ATIS, CCSA, **ETSI**, TSDSI, TTA, TTC), known as “Organizational Partners”, created in 1998, based in Sophia Antipolis, France
  - Stable environment to produce the **Reports and Specifications** defining **cellular telecommunications network technologies**, including
    - Radio access, core transport network, and service capabilities (including codecs, security, quality of service)
    - Hooks for non-radio access to the core network, and for interworking with Wi-Fi networks
- 3GPP specifications and studies are contribution-driven, by member companies, in Working Groups (WG) and at the **Technical Specification Group (TSG)** level

Mobile com. organizations (3/5)

3rd Generation Partnership Project (3GPP) (2/4)

- The three Technical Specification Groups (TSG) in 3GPP
  1. **Radio Access Networks (RAN)** /see slide 25 for dates/

- Expanding Carrier Aggregation
- Narrowband IoT
- Elevation Beamforming/Full-Dimension (FD) MIMO for LTE
- LAA: **Licensed Assisted Access**

Mobile com. organizations (4/5)

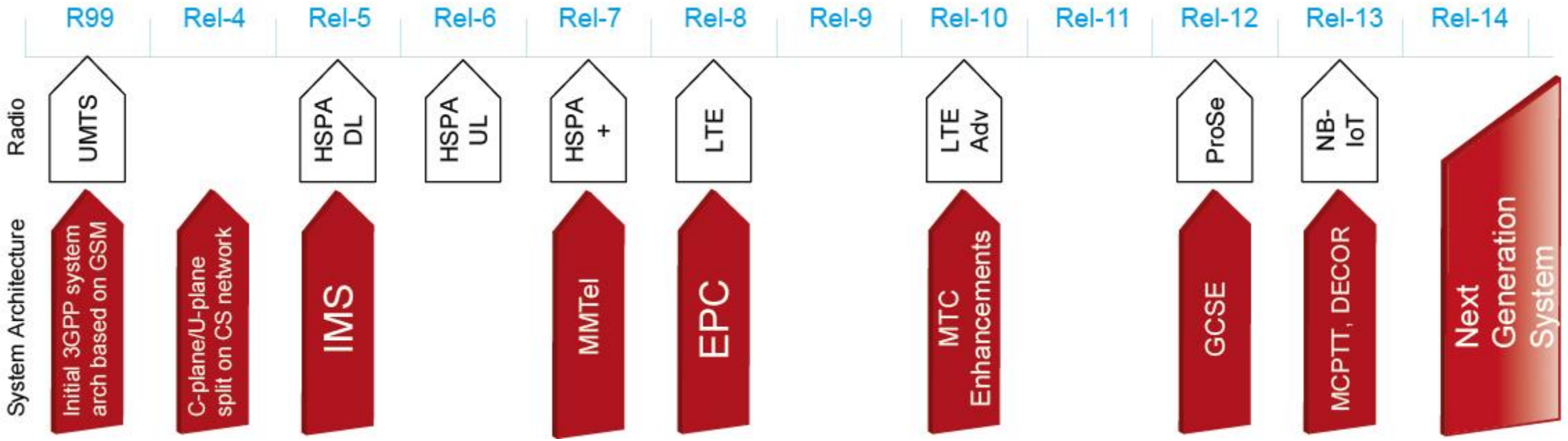
3rd Generation Partnership Project (3GPP) (3/4)

- The three Technical Specification Groups (TSG) in 3GPP
  2. **Services & Systems Aspects (SA)**
     - Definition, evolution and maintenance of the **overall system architecture** including the assignment of functions to particular subsystems (UTRAN, GERAN, CN, terminal, SIM/USIM), identification of key information flows and definition of required bearers and services offered by these different subsystems
     - Development of a framework for services**, service capabilities, service architecture, charging and consideration** of need for “default” services and/or applications
     - Definition of a **security** framework and review of security aspects of overall system
     - Management of work items including assignment of tasks to other TSGs and monitoring of progress

Mobile com. organizations (5/5)

3rd Generation Partnership Project (3GPP) (4/4)

- The three Technical Specification Groups (TSG) in 3GPP
  3. **Core Network & Terminals (CT)**



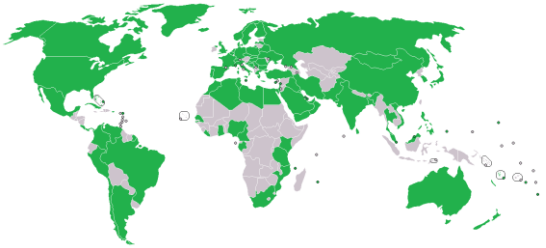
IMS: IP Multimedia Subsystem
MTC: Machine-type communication
MCPTT: Mission Critical Push to Talk

MMTel: Multimedia Telephony
GCSE: Group Communication System Enablers
Dedor: Dedicated Core Network

EPC: Evolved Packet Core
ProSe: Proximity-based services

Satellite organizations

A complex history of organizations



>100 members of IMSO

a) **International Telecommunications Satellite Organization (ITSO, or INTELSAT)**
   - An intergovernmental consortium owning and managing communications satellites providing international broadcast services between 1964 and 2001, then it was privatized as Intelsat Ltd

b) **European Telecommunications Satellite Organization (Eutelsat)**
   - An intergovernmental organization to develop and operate a satellite-based telecom infrastructure for Europe between 1977 and 2001, then it was transferred to Eutelsat S.A.

c) **International Maritime Satellite Organization (INMARSAT)**
   - A non-profit intergovernmental organization between 1979 and 1999, after that INMARSAT's operational unit was separated as Inmarsat Ltd

d) **International Mobile Satellite Organization (IMSO)** established in 1999 as successor of INMARSAT as the **intergovernmental regulatory body for satellite communications**
   - Primary purpose is the oversight of certain public satellite safety and security communication services provided by mobile satellite communication systems

Organizations of large telecom service providers

- **ETNO**: European Telecommunication Network Operators Organization
  - Contributes to shaping the best regulatory and commercial environment
  - Formed in 1992, have 39 members (former national phone companies)

- **EURESCOM**: European Research Institute on Telecommunications
  - Private organization for managing European research and development projects in telecom formed in 1991, based in Heidelberg, Germany
  - Institute of telecom service providers (13 shareholders and 2 members)

Broadcasting organizations

- **EBU:** European Broadcasting Union
  - World's leading alliance of public service media established in 1950, based in Geneva, Switzerland, 73 Members in 56 countries in Europe, and an additional 33 Associates in Asia, Africa, Australasia and the Americas
  - Operating almost 2,000 television, radio and online channels, Eurovision and Euroradio services
- **DVB** (Digital Video Broadcasting)
  - Industry-led consortium of the world's leading digital TV and technology companies to designing open technical standards for the delivery of digital TV
- **WorldDAB** (World Digital Audio Broadcasting)
  - Global industry forum for digital radio, facilitating the adoption and implementation of broadcast digital radio based on DAB / DAB+

ICT organization

DIGITALEUROPE

- **DIGITALEUROPE** is the European organization that represents the digital technology industry whose members include 60 major technology companies and 37 national trade associations
  - DIGITALEUROPE was formed in 1999 as the **European Information and Communications Technology Industry Association (EICTA)** by consolidating two former European organizations, ECTEL and EUROBIT, which represented the information and telecommunications industries
  - In 2009, EICTA rebranded as DIGITALEUROPE
  - **Mission is to foster business, policy and regulatory environment in Europe**
    - Working as positive partners with the European Institutions and other European and global bodies and, through our national trade associations, the member states of Europe
  - Members include, for example, Airbus, Apple, Cisco, Ericsson, Mastercard, Microsoft, Oracle, Siemens and many others

Associations for technical professionals (1/3)

Association for Computing Machinery (ACM)

- **ACM is an international learned society for computing**
  - The world's largest scientific and educational computing society, founded in 1947
  - A not-for-profit professional membership group based in New York City, USA
  - Its membership is more than 100,000
- Organized into over 171 local chapters and 37 **Special Interest Groups (SIGs)**, having more than 500 college and university chapters
  - Such as SIGGRAPH (computer graphics), SIGPLAN (programming languages), and SIGCOMM (data communication), sponsor regular conferences
  - ACM publishes over 50 journals including the prestigious Journal of the ACM
    - E.g., joint with IEEE: IEEE/ACM Transactions on Networking (TON)

Associations for technical professionals (2/3)

Institute of Electrical and Electronics Engineers (IEEE) (1/2)

IEEE
Advancing Technology for Humanity

- **IEEE is a professional association**
  - The world's largest association of technical professionals with more than 420,000 members in over 160 countries around the world founded in 1963
  - Core purpose is to foster technological innovation and excellence for the benefit of humanity, based in New York City and Piscataway, USA
- Various **technical areas** are addressed by IEEE's 39 **societies** providing specialized publications, conferences, business networking and services
  - Societies include Computer, Communications, Signal Processing among many
  - IEEE produces over 30% of the world's literature in the electrical and electronics engineering and computer science fields, publishing well over 100 peer-reviewed journals

Associations for technical professionals (3/3)

Institute of Electrical and Electronics Engineers (IEEE) (2/2)

IEEE
Advancing Technology for Humanity

- **IEEE standardization activities**
  - With an active portfolio of nearly 1,300 standards and projects under development, IEEE is a leading developer of industry standards
  - One of the more notable are the IEEE 802 LAN/MAN group of standards, with the widely used computer networking standards for both wired (ethernet, aka IEEE 802.3) and wireless (**IEEE 802.11** and IEEE 802.16) networks
    - **Wi-Fi** is a technology for wireless local area networking with devices based on the IEEE 802.11 standards, is a trademark of the Wi-Fi Alliance, which restricts the use of the term Wi-Fi Certified to products that successfully complete interoperability certification testing
  - IEEE 1284: parallel port
  - IEEE 1394: serial bus – "FireWire", "i.Link"

Wi Fi ALLIANCE
Wi Fi CERTIFIED

THANK YOU FOR YOUR ATTENTION!

Engineering Management BMEVITMMB03
BME Fac. EE &IT MSc Majors
Economic & human themes

INFOCOM REGULATION

Dr. Sallai – Dr. Kósa

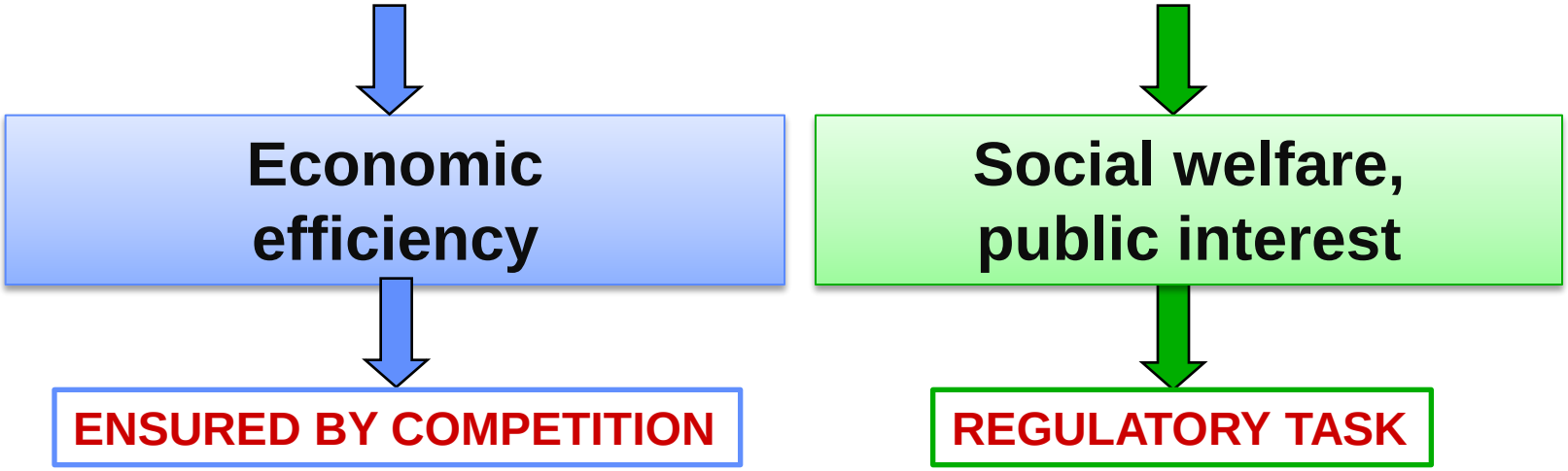
BME Dept. Telecommunications and Media Informatics

Budapest, spring of 2018

WHY TO REGULATE?

Provide public utilities in a balanced way to the public

(telecom/media, electricity, water, gas, post, etc.)



Public utility: Business activity influenced by public interests

- Availability and price of basic services are regulated
- Service provisioning is accompanied by proper obligations for the service providers (e.g. co-operation, safety)
- The regulatory influence can be reduced if competition is expanding

PRINCIPLES OF REGULATION

Why is it necessary to regulate at all?

- Technical and social reasons of regulation
  - *Integrity, interworking of networks*
  - *Security of devices, transactions, etc.*
  - *Frequencies, identifiers are scarce resources*
  - *Insufficiency of market mechanisms*

What, whom and how to regulate ?

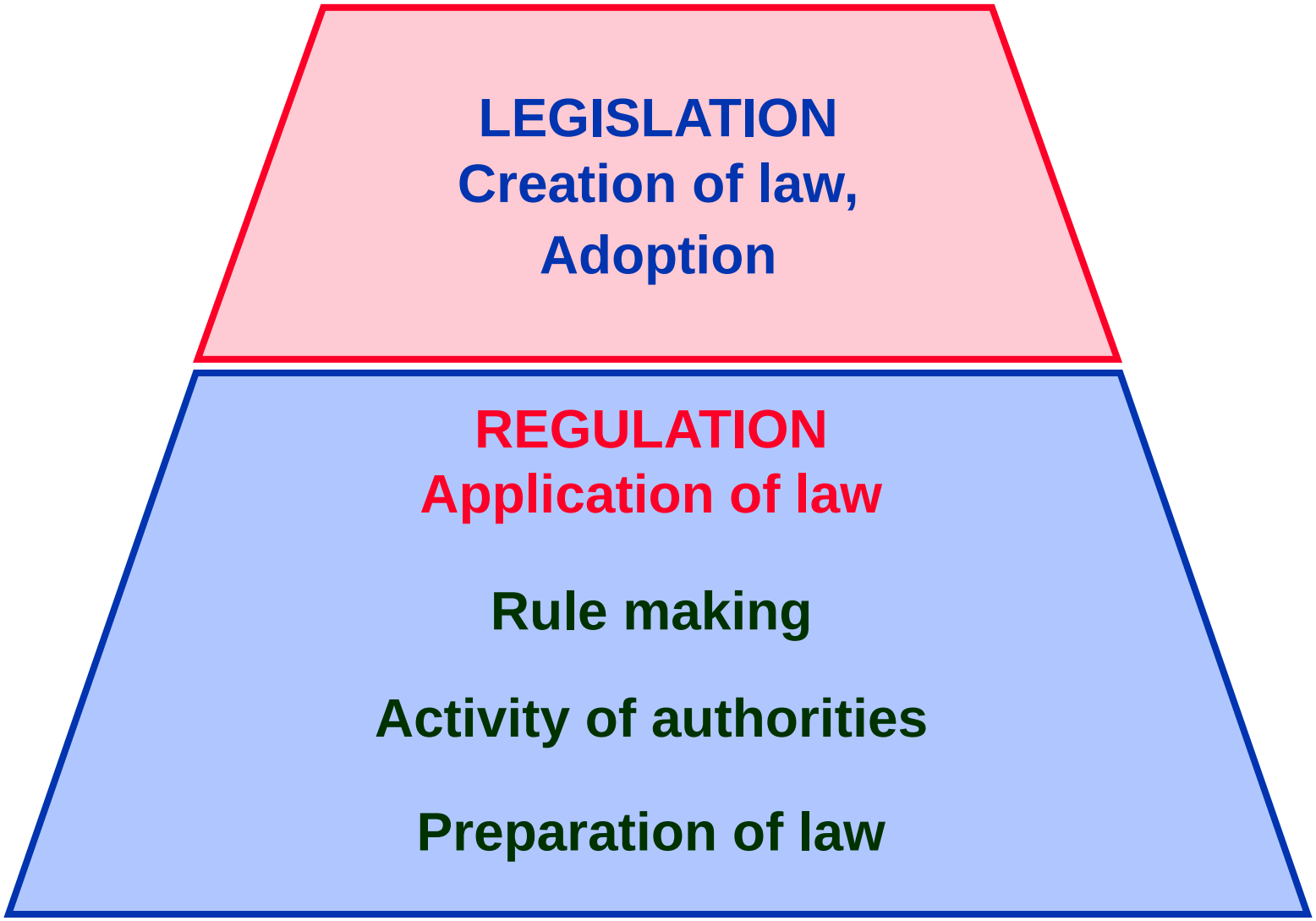
- Subject of regulation
- Range of regulated ones
- Forms, methods, institutions of regulation

} Areas of regulation

Aims and models of regulation change in time, because the international, technical, economical, legal environment of regulation is changing as well

Preliminaries: Regulation of public utility networks (historically)
Competition based regulation (in general)
EC regulation (directives)

LEGAL STATUS OF REGULATION



REGULATORY INSTRUMENTS

Laws (acts, government and ministry decrees)

- **General, competition based regulations**
- **Sector specific regulations**

Instruments of regulatory authority (legal frame):

- **Ex ante:** rulemaking, e.g.
  - rules of the resource management,
  - rules of handling significant market power (ex ante),
  - individual licensing (authority activity)
- **Ex post:** enforcement, e.g.
  - market supervision (e.g. complience of services, equipment),
  - handling significant market power violation (ex post),
  - taking sanctions, punishments
- **Dispute resolution:** mediation among market players
  - state administration procedures (regulatory authority)
  - arbitration (selected court)
  - proceedings at the court

Self and co-regulation

- **Self regulation:** reconciliary forum of market players, ethic codex, etc.
- **Co-regulation:** task sharing by market players and authority

LEGAL ENVIRONMENT OF ICT

LAWS

- Basic Act
- Acts
- Government decrees
- Ministry decrees

INSTITUTIONS

- Constitution court
- Parliament
- Government
- Ministries **(Ministry of National Development)**
- Regulatory authorities (**National Media and Comm. Authority**, **Economic Competition Office,** **Authority for Consumer Protection)**

Interpretation of law

Creation of law

Application of law

State duties

PUBLIC BODIES, SOCIAL ORGANISATIONS

- Hungarian Academy of Sciences, Hungarian Standards Body
- Reconciliation organisations (e.g. Association of IT Enterprises, Inforum)
- Civil organisations (e.g. Scientific Association for Infocommunications, HTE)

EFFICIENCY OF THE COMPETITIVE MARKET

The operation and efficiency of competition depends on:

- the structure of the sector (oligopoly);
- the conditions of market entry and market leaving;
- the difficulties and costs of changing service provider (e.g. number portability, carrier selection);
- the transparency of the market (information for consumers).

Limits of the market mechanisms:

Competition failures (to be corrected by *the authority*):

- not able to handle *market dominance* (SMP)*;*
- not suitable at *public utilities* (can't be stopped);
- improper management of *scarce resources.*

Competition doesn't take into account *the social and political expectation,* e.g.**:**

- social targets (universal service expectations);
- long-range infrastructure investment demands;
- employment, cultural, etc. considerations;
- personal, property and state security requirements.

REGULATORY MODELS
(WHAT, WHOM, HOW TO REGULATE?)

What? **System (technological, technical) regulation:**
subject: technology, equipment, network, service.

Whom? **Market (economic) regulation:**
market players: service providers, vendors.

The regulatory model changes with respect to area and time, depending on

- the features of the public network (e.g. telecom network)
- the development of technology (optimal size, convergence)
- the intensity of the competition, the market structure (oligopoly)
- the changing social demand (e.g. universal telecom service)

In the telecommunication 4 phases can be distinguished:

1. Period of natural monopoly
2. Period of the emergence of competitive environment
3. Period of the expansion of infocommunication convergence
4. Period of advanced information society as a perspective.

(EU) COMMUNITY MODEL OF THE INFOCOMMUNICATIONS REGULATION

Information society applications and their content-infrastructure

(e.g. e-commerce, e-administration; databases, multimedia archives, content handling, security systems)

E – infocom services

(e.g. fixed and mobile telephone, telefax, e-mail, packet switched data comm., VPN service, Internet service, radio and TV services)

E – infocom networks

(e.g. fixed, mobile, satellite, CATV, ADSL, intelligent networks, powerline systems, radio and TV broadcasting networks)

DEVELOPMENT PERIODS OF TELECOM/INFOCOM

Period		Technology, network	Service	Market structure	Regulation
1.	Natural monopoly	One hierarchic net-work per country	Telephone service	Single monopol national provider	Technology regulation
2.	Liberalisation, form-ation of competitive environment	Digital networks	Intelligent and mobile services	New market play-ers, horizontal rearrangement	Asymmetric competition regulation
3.	Infokommunications convergence	Convergence of telecom, IT and media	Internet; global mobile multimedia	Vertical market integrations	Harmonisation and minimisation of specific regulation
4.	Network based knowledge society	Integrated information society technologies	Integrated information society applications	Widening market integration	Slightly regulated competition (scarce resources)

PHASE 1 (- 1990) NATURAL MONOPOLY

Monopoly ensures the economic efficiency
Only telephone and telegraph services

Technical regulation: Basic technical plans

- Structure plan of the network
- Traffic routing plan
- Signalling plan (interworking of the switches)
- Synchronisation plan (digital network)
- Numbering plan, number management
- Frequency plan, frequency management

Economic regulation:

State property (National PTT – Post, Telephone & Telegraph)

- Weak economic efficiency and provisioning of demands
- Harmonisation by the state (fixed prices by the authority, etc.)
- Regulation as stand alone function is not present

PHASE 2 (1990-2002) PERIOD OF LIBERALISATION

Starring the regulator (regulatory authority)

- *Facilitates the formation of competition on the market* (liberalisation, easier market entry, handling SMP)
- *Deployment of universal telecom service* (specification, incumbents, financing) 2002 EC directive

Measurement of the intensity of competition

based on the market shares of the competitors:

INT=1-HHI, where HHI is the ***Herfindahl-Hirschman Index***

$$HHI = \sum_i R_i^2 ,$$ where R_i is market share of the ith firm.

$$0 < HHI \leq 1$$

$$\sum_i R_i = 1$$

In case of monopoly HHI=1 and INT=0. If there are two competitors with equal market share then HHI=0.5 and INT=0.5 as well.
The competition is efficient (INT is high) if HHI is small, e.g. HHI < 0,2.

TELECOM SPECIFIC EX_ANTE REGULATORY INSTRUMENTS to strengthen competition

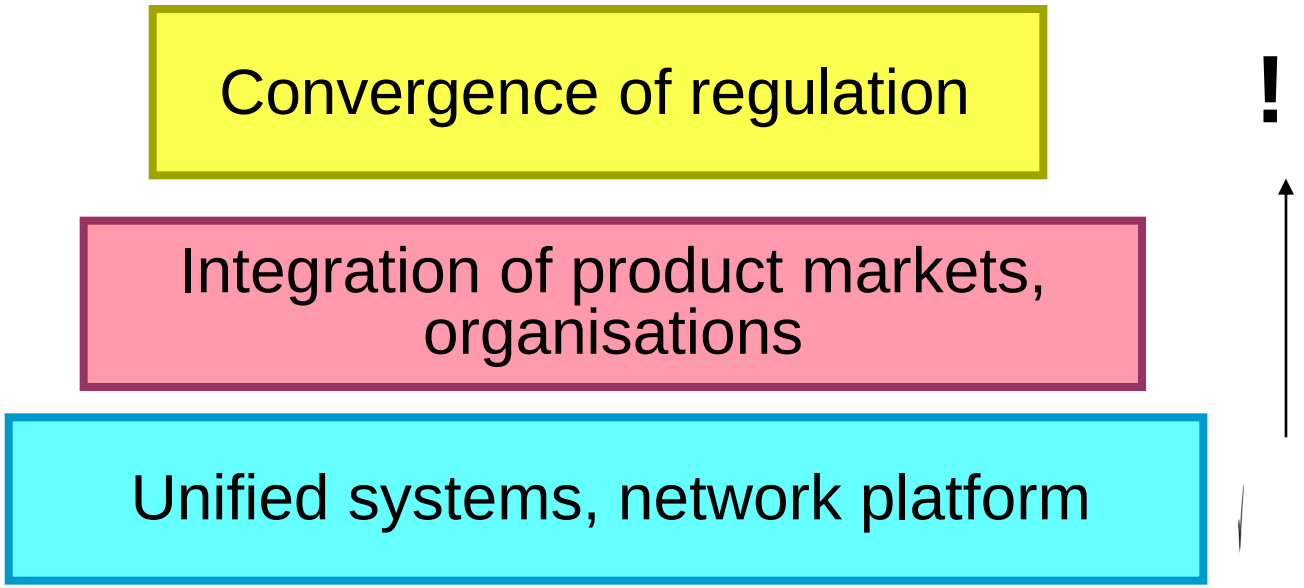
- *simplifying* ***market entry*** no exclusivity, only registration
- *transparent, open procedures for the* ***resources*** application, tender, auction, e.g. frequency
- *liberalisation of* ***equipment*** *(CPE) market* declaration of compliance instead of type inspection
- ***number portability*** (in fixed, in mobile)
- ***carrier selection*** (transit service provider)
- obligations of service providers with ***significant market power asymmetric regulation:***
    - interconnection of networks (RIO)
    - interworking of service providers
    - access to networks,
    - local loop sharing=unbundling (RUO)
- ***quality and safety*** supervision by authorities, etc.

❖ **control of mergers, acquisitions** (ex-ante by Competition Authority)

PHASE 3 PERIOD OF CONVERGENCE

By virtue of technological development the converging areas require harmonized regulation suitable for the demands of the information society.

Stages of infocommunications convergence



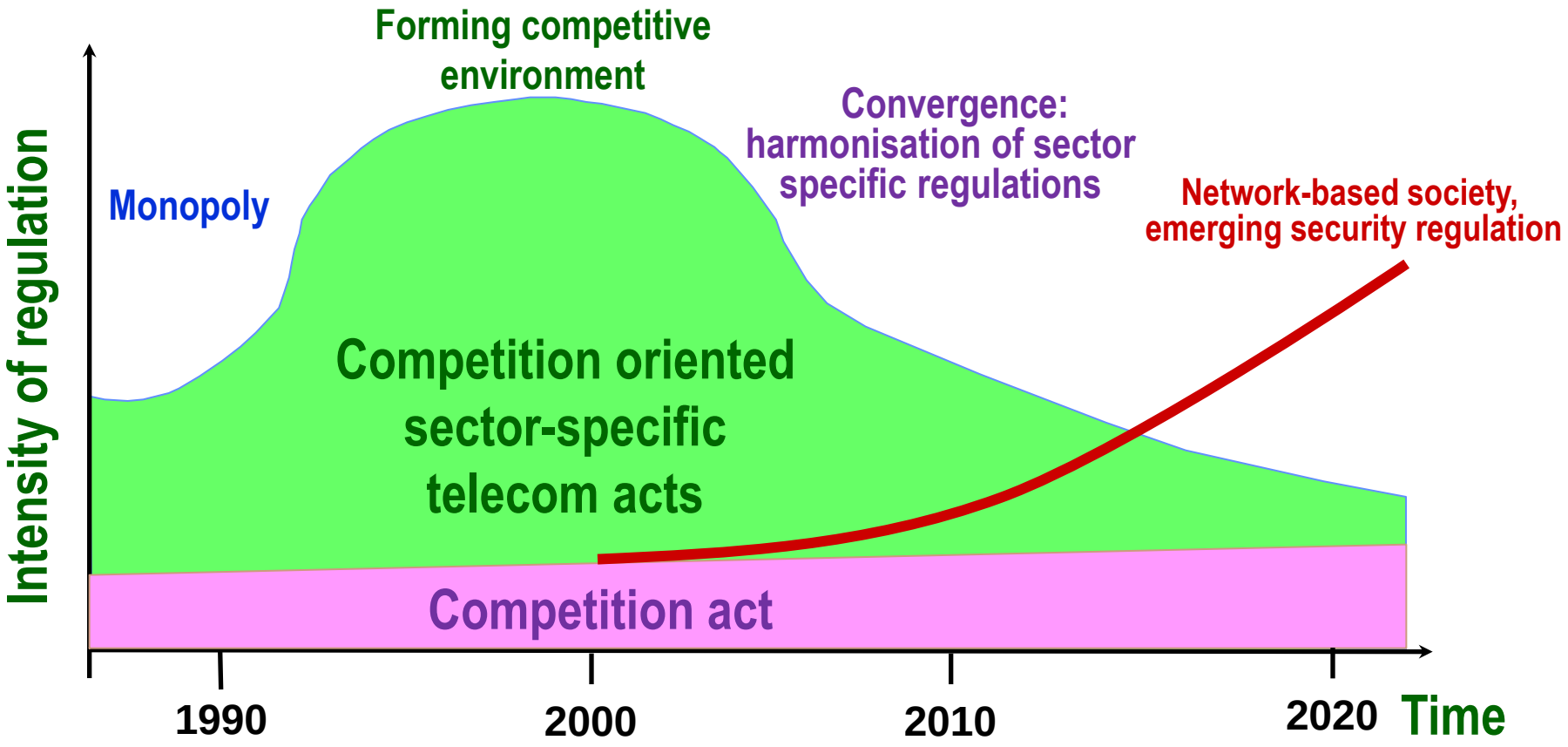
HARMONISATION OF REGULATION

regulatory instruments of the expanding convergence

- general **competition regulation** instead of telecom-specific regulation (e.g. how to handle significant market power)
- ***technology-neutrality*** *in regulation* (as it is possible)
  unified handling of different technologies, e.g.
  PSTN, IP, CATV, terrestrial, satellite broadcasting, etc.
  interconnection, carrier selection, number portability
- ***unified*** *regulation of* ***market entry***
  general authorisation + individual notification
- *EU level* ***harmonisation*** *of regulation*
  - obligatory directives of regulation
  - *co-ordinated activity of* regulatory authorities
    (increased EU control, obligatory co-operation)
- *handling* ***new*** *convergence related* ***regulatory issues****:*
  - information security
  - regulation of media and content services
  - revision of personal and intellectual property rights

REGULATORY TREND:

decrease of sector-specific regulation,
increase of competition regulation,
emerging security regulation



AREAS OF INFOCOM REGULATION now

- **Technical regulation** (network integrity, security)
- **Resource management**
  - Frequency management
  - Identifier management (numbers, names, addresses)
- **Regulation of market entry** (authorisation, notification)
  - resource, network, service
  - customer premises equipment (CPE)
  - radio and TV broadcasting services
- **Regulation of market activity**
  - interconnection, access, facility sharing
  - number portability, carrier selection
  - regulation of competition (e.g. market power, market structure)
- **Consumer protection**
  - Consumers' rights (e.g. data protection, claim handling)
  - Price regulation
  - Quality regulation (service, equipment complience)
  - Universal telecom service
- **IT regulation** (infrastructure, security, etc.)
- **Authority procedures, regulatory mechanisms**

Network-based knowledge society

4. phase Actualities in regulation

Innovation ->

Neutrality in technology in allocation of scared resources

http://ec.europa.eu/digital-agenda/en/net-neutrality-challenges

Institutions->

Converging Authorities dealing with converging market

http://berec.europa.eu/

Investments ->

Sector specific and competition regulation should be balanced

„Emerging markets without regulation?"

http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=2734

Security issues ->

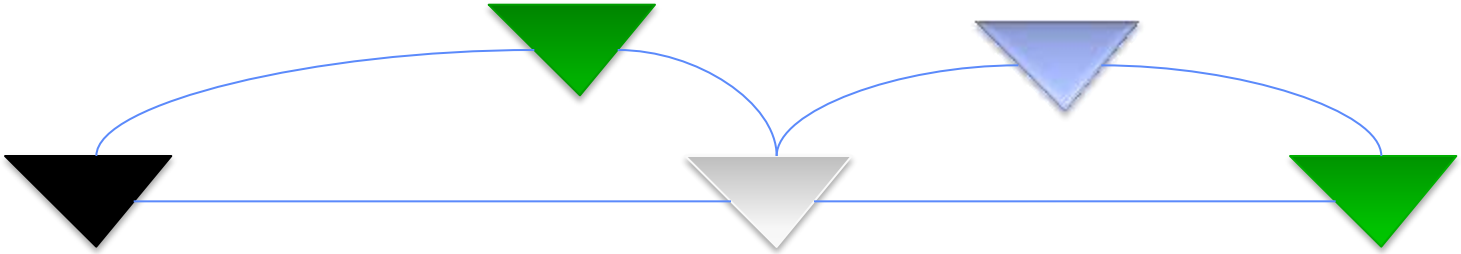
Critical infrastructures are to be safe, including ICT based controlls of them and relevant contents

https://ec.europa.eu/digital-agenda/en/our-goals/pillar-iii-trust-security

European (Regional) Agency or national regulatory agencies?

Regional Regulatory Agency ERG, BEREC

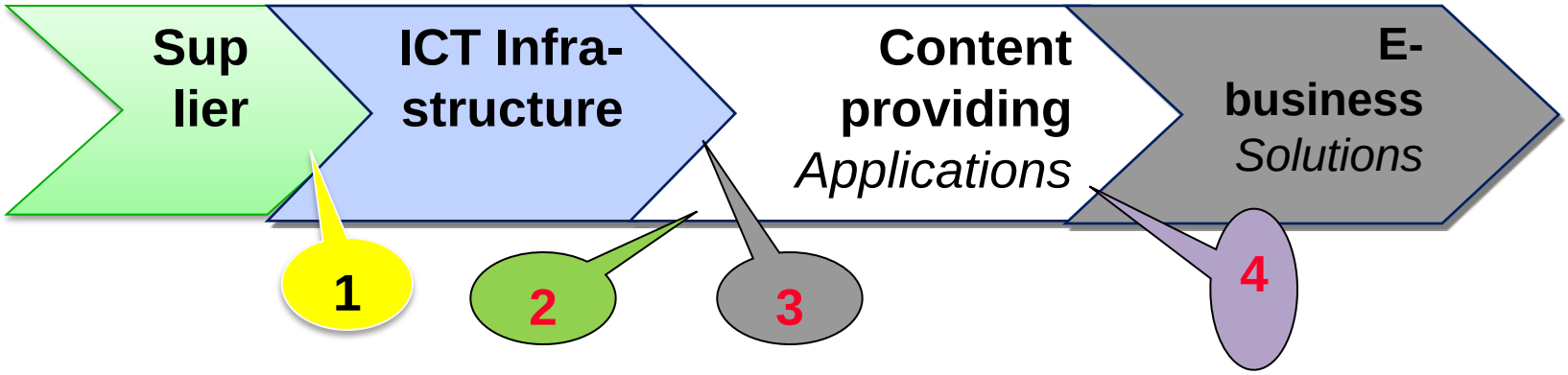
Network of the national regulatory agencies



Integrated Euorpean ICT market

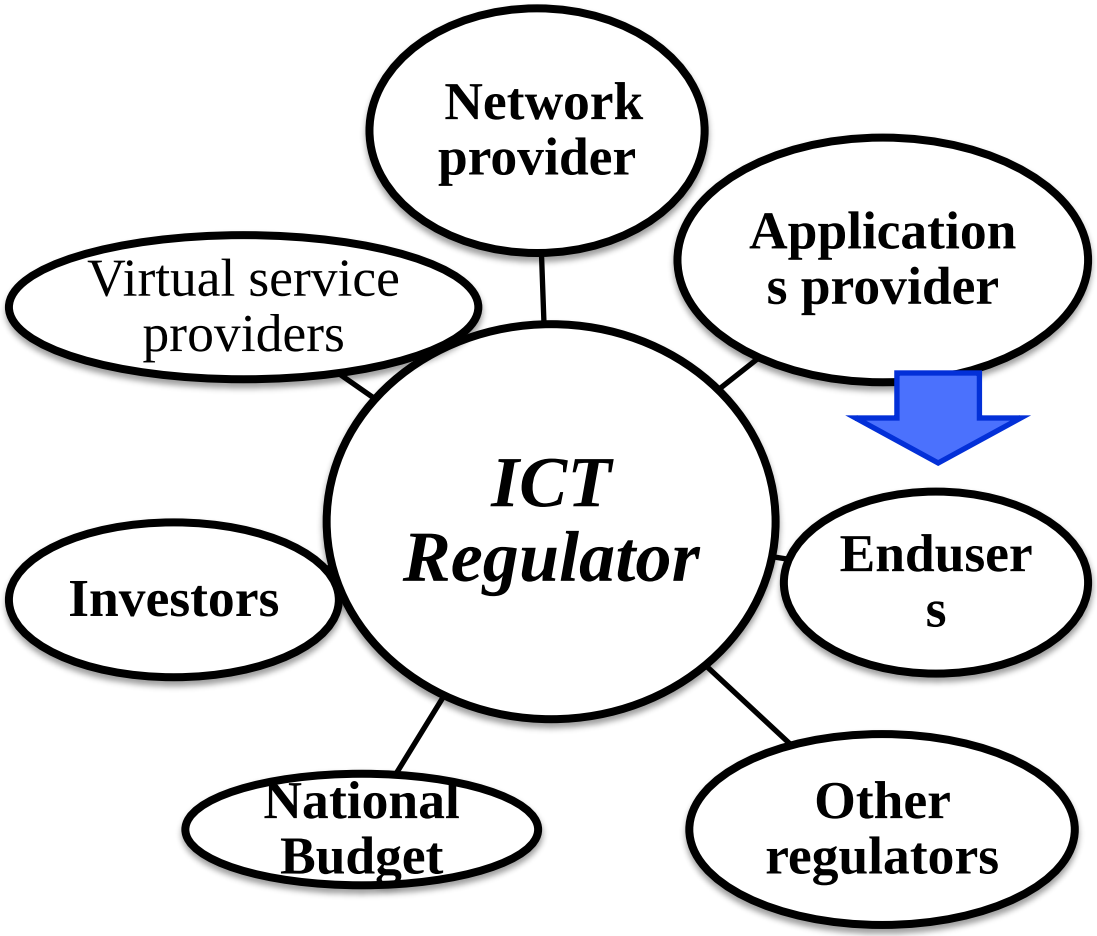
https://ec.europa.eu/digital-agenda/en/digital-single-market

Extension of ICT market



(1) **Based on new technology the quality improves, prices go down, the infrastructure enters into new business areas**
(2) **Complementer businesses emerge based on the infrastructure**
(3) **Value chains are joining, providing new complex service for the users**
(4) **The new complex service becomes as a basis for other industries as business infrastructure**

National Regulatory Authority for ICT



Institution

- *is not perfect,*
- *administrative costs*

Energy and power

is limited to enforce decisions

Should react to

- changes on the market,

- emerging new security issues

Long term Vision for ICT regulation

Basic infrastructure for all

- Network access points and rights
- Long term archivation services
- Trusted agents
- Data sovereignity for persons, organizations and states

Critical infrastructure

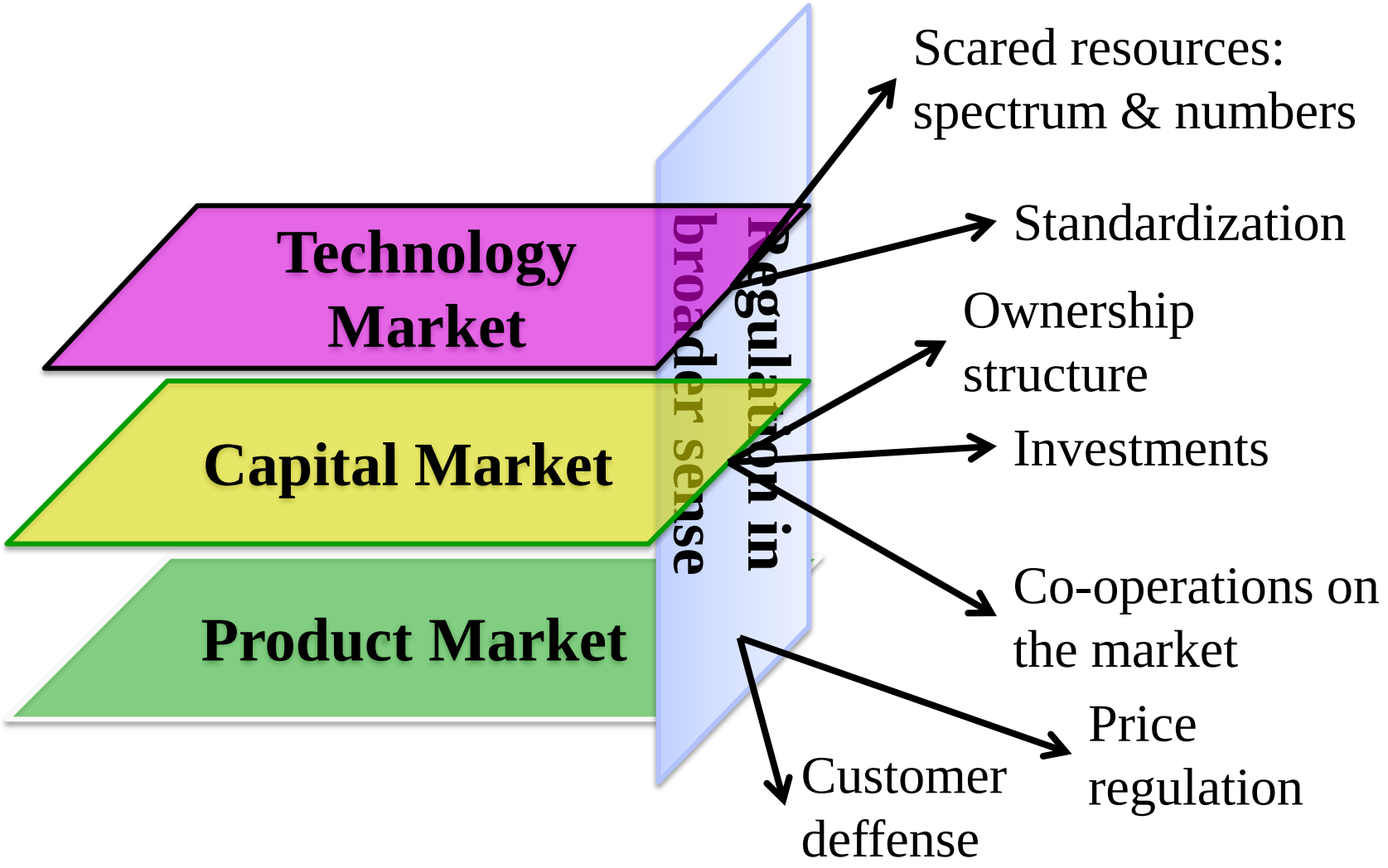
- Energy sector
- Transportation
- ICT control of infrastructure
- ICT access

Regulated environment for digital living:

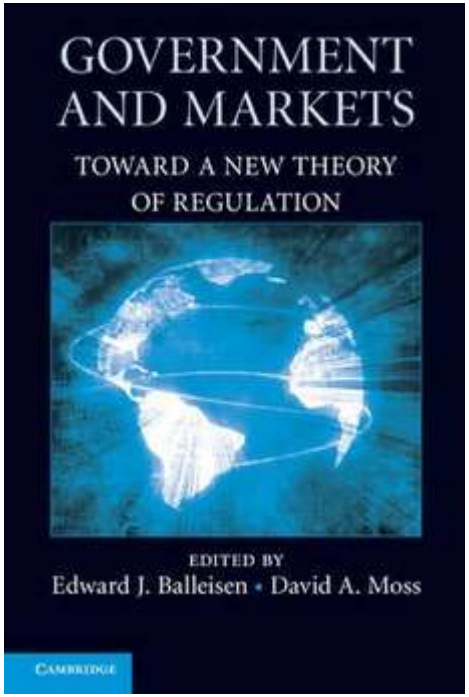
- *Online contents*
- *E-applications*
- *Intelligent transport*
- *Public services based on e-applications, such as*

e-learning, e-health, e-administrating,…

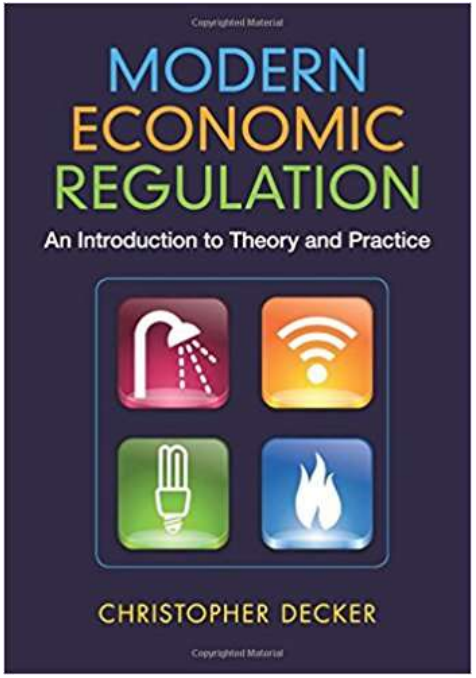
Σ Regulation Issues



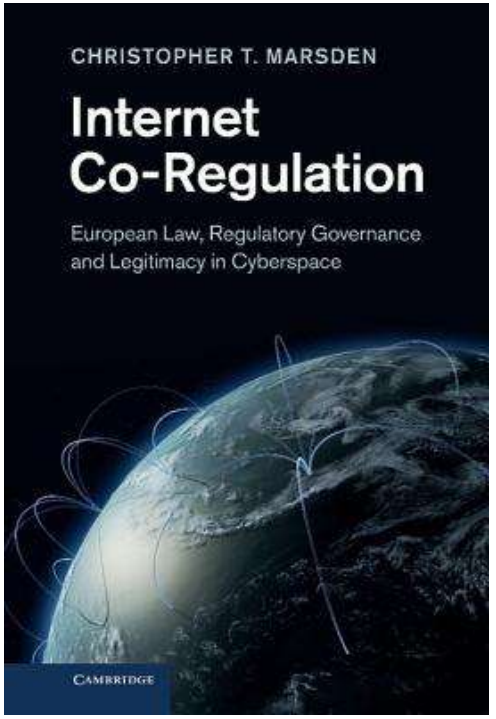
Books on the topic for further interest



https://www.whsmith.co.uk/products/government-and-markets-toward-a-new-theory-of-regulation/9780521280853



https://www.amazon.co.uk/modern-economic-regulation-introduction-practice/dp/1107699061



https://www.bookdepository.com/Internet-Co-regulation-Christopher-T-Marsden/9781107003484

Engineering Management BMEVITMMB03

BME Faculty of Electrical Engineering and Informatics,

MSc EE and IT Majors Economic & human themes

FREQUENCY MANAGEMENT

Part 1

Prof. János Grad

BME Department of Telecommunications and Media Informatics

Budapest, spring of 2018

What is the radiowave ?

- Electromagnetic radiation
  - guided (directed by waveguide)
  - not guided (free propagation)
- Frequency: 0 … 3000 GHz

Electromagnetic radiation above 3000 GHz
e.g. infrared light,
visible light,
ultraviolet light,
röntgen radiation,
etc.
does not consist of the subject of radio.

Tasks of the frequency management

Radio radiation (electromagnetic radiation below 3000 GHz)

- guided (radiation directed by waveguide)
- not guided (free propagation)

Interference: Interaction of radio waves inside a radio receiver

Tasks:

(1)Regulations of the use of frequencies for

- development,
- enforcement

of rules for the avoidance of radio **interference**

(2)Regulation of the use of satellite orbits

(3)Regulation of the use of electromagnetic radiation with free propagation above 3000 GHz

Interference

Receiver input:
- useful signal
- **unintended signals – source of interference**
- noise

Scenario 1: unintended signal **inside** the receiver-band

Scenario 2: unintended signal **outside** the receiver band

Whose task is the avoidance of interference?

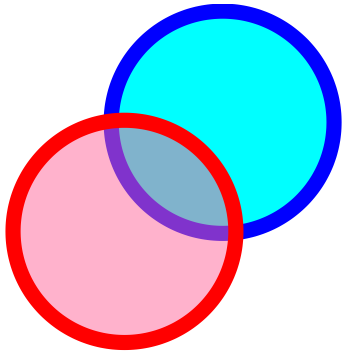
National administrations:
- internationally
- domestically – between different service providers

Service providers:
- their own interference
- they may posses international rights

Interference Scenario 1

Receiver input: Useful signal + interferers inside of its own frequency band

Radio systems operating in the same band.



The two systems can be in possession of

- the same operator,
- different operators in the same country

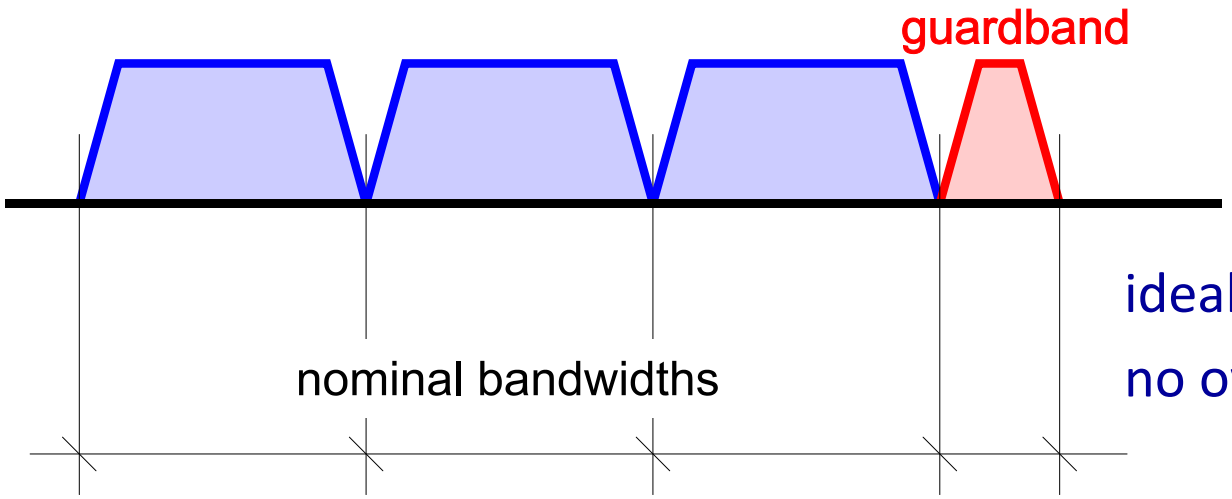
They can be deployed in neighbouring countries !

Interference Scenario 2

Radio systems operating in adjacent frequency bands.

Bandwidth types:
- nominal bandwidth (administrative bandwidth)
- spectrum bandwidth (transmitter bandwidth)
- receiver bandwidth

Nominal (administrative) bandwidth

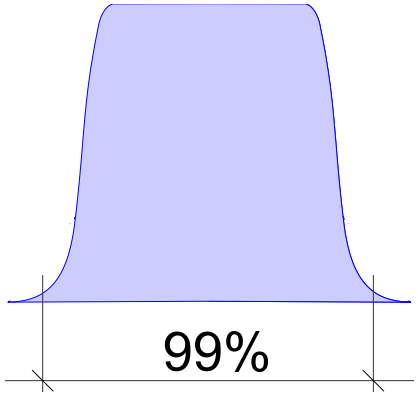


ideal characteristics

no overlapping

Interference Scenario 2

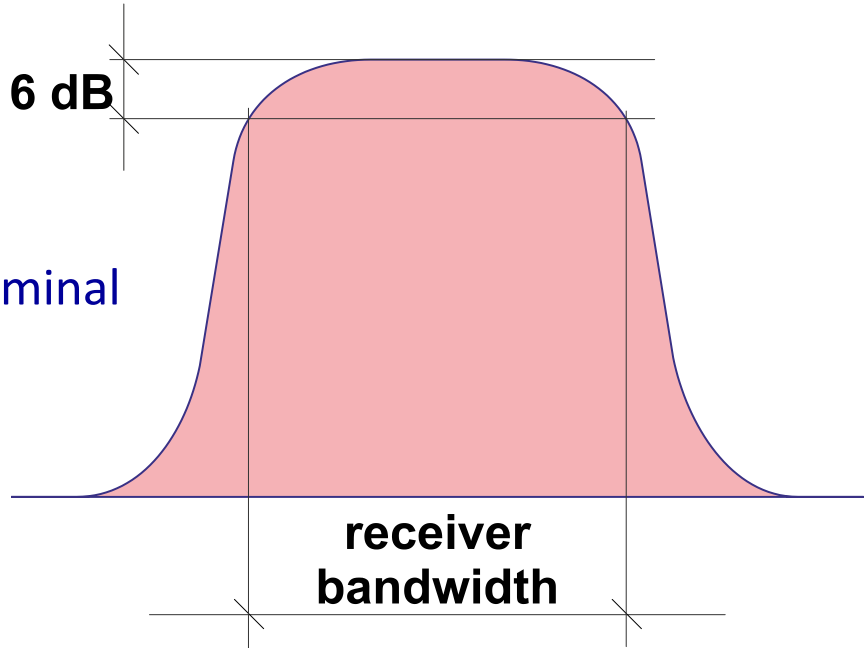
Spectrum bandwidth (transmitter bandwidth)



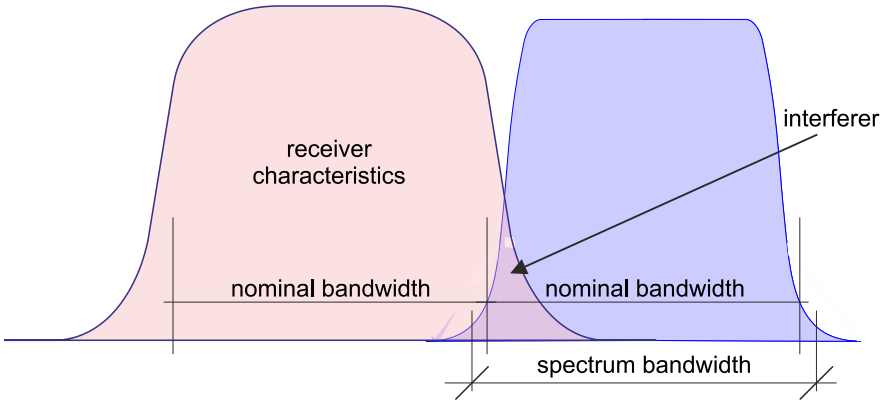
Sometimes it is larger than the nominal bandwidth ⟹ spectrum overlapping

Receiver bandwidth

In practice it is always larger than the nominal bandwidth ⟹ restricted filtering



Adjacent channel interference



A part of spectrum from adjacent channels will be received.

International regulations

Worldwide regulations

A task of the UNO – International Telecommunication Union (ITU)

Collection of rules: Radio Regulations (RR) (2016)

free copy: www.itu.int/pub/R-REG-RR-2016

It controls the international relations only.

Areas of regulations:

- Use of radio spectrum

It shall proceed inside a country:
The **mandatory** requirements at the borderlines must be fulfilled.

- Use of electromagnetic spectrum above the radio band
- Use of satellites

Creator: World Radio Conference, 2015 (WRC-15), Geneva
Accepted: by 152 countries

Next World Radio Conference in 2019

RR Article 1 – Terms and definitions (1)

Section I. General terms

1.2 Administration

1.6 Radiocommunication

1.13 Radio astronomy

1.15 Industrial, scientific and medical (ISM) applications

Section II. Specific terms related to frequency management

1.16 Allocation

1.17 Allotment

1.18 Assignment

Section III. Radio services

1.19 Radiocommunication service

1.20 Fixed service

1.33 Aeronautical mobile (R) service

Section IV. Radio stations and systems

1.67 Mobile station

1.87 Radionavigation mobile station

1.101 Primary radar

RR Article 1 – Terms and definitions (2)

Section V. Operational terms

1.124 Radiotelephone call

1.126 Duplex operation

1.132 Radiotelemetry

Section VI. Charasteristics of emissions and radio equipment

1.140 Single-sideband emission

1.145 Spurious emission

1.153 Occupied bandwidth

Section VII. Frequency sharing

1.166 Interference

1.171 Coordination area

1.174 Equivalent satellite link noise temperature

Section VIII. Technical terms relating to space

1.166 Passive sensor

1.189 Geostationary satellite

1.191 Steerable satellite beam

Radio stations

RR 1.61: Station

Transmitter or receiver equipment at one location for carrying on a radiocommunication service or

Radio astronomy service.

- Terrestrial stations
- Earth stations (in statellite services, in pair with space stations)
- Space stations (in pair with earth stations)
- High altitude platform stations
- Aeronautical stations
- Aircraft stations
- Ship stations

etc.

Examples for definitions in RR

RR 1.69: Land station: A station in the mobile service not intended to be used while in motion.

RR 1.74: Land mobile earth station: A mobile earth station in the land mobile satellite service capable of surface movement within the geographical limits of a country or continent.

Radio services

RR 1.19: Radiocommunication service

A service involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes.

Task of RR: Allocation and technical regulation of

- radiocommunication services
- radio astronomy
- Industrial, scientific and medical (ISM) applications

Terrestrial – satellite pairs

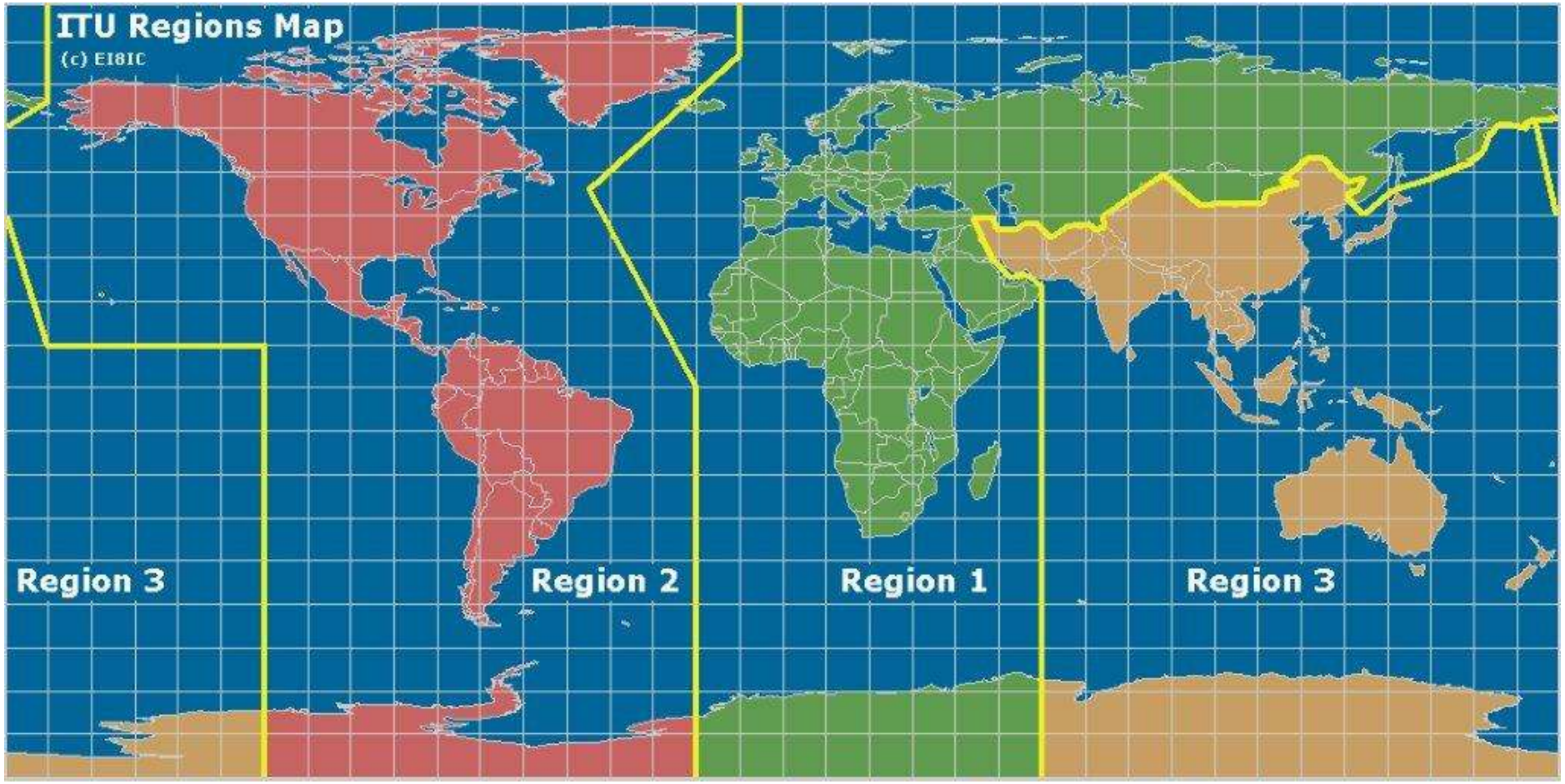
fixed service - fixed satellite service

mobile service - mobile satellite sevice

broadcasting service - broadcasting satellite service

radionavigation service - radionavigation satellite service

3 regulatory regions



Regulatory regions

Region 1:

- Europe, former Soviet Union, Mongolia
- Africa
- Arab countries

Region 2: America

Region 3:

- Asia

(except for Asian countries belonging to Region 1)

- Pacific countries

Regulatory proposals come from the regulatory organizations for telecommunications of the individual regions

- Region 1 is heterogenous, it is very difficult to generate a common proposal
- Region 2 and Region 3 can create regional agreements easily

Organizations for regional regulations

Region 1

- Europe

  Conférence **e**uropéenne des administrations des **p**ostes et des **t**élécommunications (CEPT)

  European Conference of Postal and Telecommunications Administrations

- Successor states of the former Soviet Union

  Regional **C**ommonwealth in the field of **C**ommunications (RCC)

- Arab countries

  League of **A**rab **S**tates (LAS)

- Africa

  African **T**elecommunications **U**nion (ATU)

- Mongolia

  a member of APT

Organizations for regional regulations

Region 2

America

Comisión Interamericana de Telecomunicaciones (CITEL)

Inter-American Telecommunication Commission

Region 3

Asia-Pacific Telecommunity (APT)

Members:

Asian and Pacific countries

Mongolia (Region 1)

(Not members:

Arab countries and

the successor states of the former Soviet Union)

Organisations for regional regulations

African Telecommunications Union (**ATU**)

Arab Spectrum Management Group (**ASMG**)

Asia-Pacific Telecommunity (**APT**)

European Conference of Postal and Telecommunications Administrations (**CEPT**)

Inter-American Telecommunication Commission (**CITEL**)

Regional Commonwealth in the Field of Communications (**RCC**)

NATO regulations

NATO = North Atlantic Treaty Organization

- America: USA
  Canada
- Europe: Turkey
  .....

Frequency Management:

Central office: SC3IB

NARFA (National Office) in each NATO member-country

in Hungary: Dep. for Spectrum Managing and NATO

Regulations in Europe

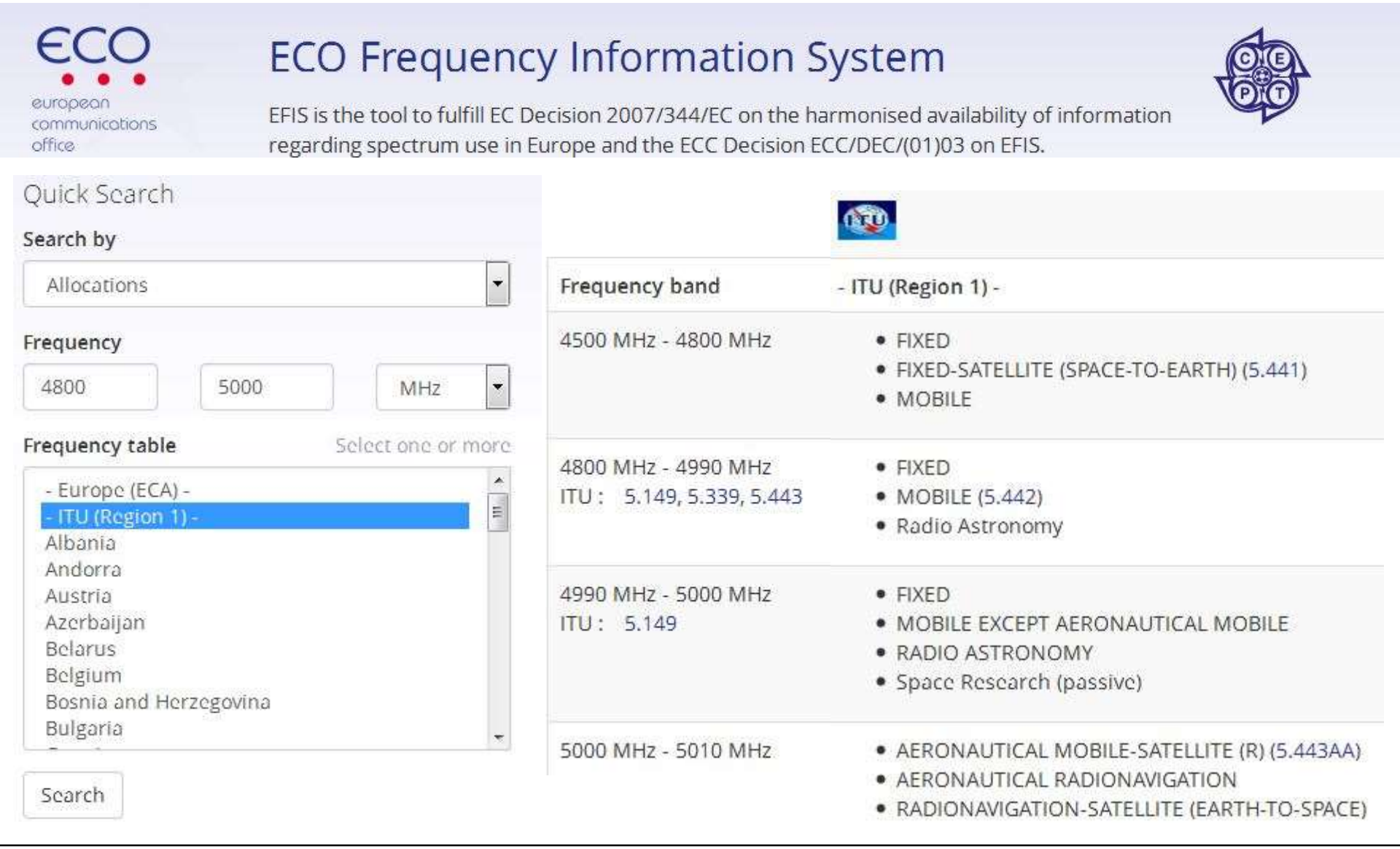
It gives rules to the **internal radio use** of the European countries

Organizations:

- CEPT-ECC (Electronic Communications Commitee)
  (46 European memberstates)
  acceptation of decisions is recommended but **not obligatory**
- ETSI – European Telecommunications Standards Institute
  acceptation of decisions is recommended but **not obligatory**
- EU – European Union: 27 member states – the majority of regulations is **obligatory**, in these cases the rules shall be taken in the national law
- European Planning Conferences
  obligatoty international agreements
- Bi- and multilateral agreements
  obligatory

E F I S

www.efis.dk



International operative measurements

ITU Radio Office (Geneva)

International protection against interference:

The radio system shall be submitted to the ITU Radio Office in advance and the Office registers this system

The instrument for protection against interference:

international coordination

Method:

ITU Radio Office informs every country about the new radio stations and radio systems submitted previously in Circular Letter every week. Authorities of any country can raise objection to a new system.

End of Part 1

Engineering Management BMEVITMMB03

BME Faculty of Electrical Engineering and Informatics,

MSc EE and IT Majors Economic & human themes

FREQUENCY MANAGEMENT

Part 2

Prof. János Grad

BME Department of Telecommunications and Media Informatics

Budapest, spring of 2018

National institutional background

The countries shall establish the institutional system supplying the functions of frequency management

- in the civil sector (economy)
- in the governmental sector (eg. military)

Tasks:

- development of rules

a national frequency table shall be created

- international coordination
- licencing
- registration

Methods for licencing

(1) Licence-free method

(2) Registration

(3) Licencing method on the basis of order

(4) Tender

(5) Auction

(1) Licence-free method

This method is the basis in the EU

Use:

- Likelihood of interference is very low
- There is no need for the authorities to know anything about the transmitter and receiver (stations)

Regulatory conditions:

A given application

- must not cause interference to others
- can not get interference-protection against other stations

(2) Registration

Use:

if the given radio application was meant to license –
it can not be refused, e.g.

- the likelihood of interferences is very low or
- deployment of stations does not have any technical preconditions

but the authorities have to know

- the locations of transmitter and receiver (stations)
- the date of the deployment

Example to registration

European licensing method of point-to-point links with Gbit/s speed operating in the band 71-76/81-86 GHz

- likelihood of interference is very low at this type of radio links but
- the operation is allocated in a NATO-band where a military satellite application is planned

Request of NATO: information on the locations of stations of the radio links

Consequence:

Registration (instead of licence-free method)

(3) Licencing in time order

(on the *first comes, first served* basis)

ITU position: Basic method in international relations is

- individual licensing
- licensing in time order

By radio services and freqency bands, there is a well elaborated regulation for licensing.

The applicant shall prove it will not cause interference to a former operator and an individual radio license can be granted.

A licensed station get protection against interferences origined from later deployments.

(4-5) Procedures with competition

(4) Tender

(5) Auction

The object of competition: the right of frequency use

It shall define for frequency blocks in advance

Scope by area :

- country wide
- regional – it is possible that interference comes into existence because of radiation trough the borders of regions

Public announcement

- ❖ Technical conditions
- ❖ Conditions to the procedure:

aggregation limit

criteria for the service conditions for payment

(4) Tender

Conditions can be changed any time (even during the procedure)

Applied if

- ❖ the market interest is not sufficient
- ❖ the achivement of particular criteria in the telecommunications policy is substantial
- ❖ incomes in money are secondary only
- ❖ more criteria for evaluation can be realized at the same time
- ❖ there is no adequate software for the arrangement of auction

(5) Auction

There is one criterium for granting the right of freqency use: this is money (fee of auction)

Other conditions for radio use are defined by the conditions of participation. An accomplishment above the minimum-requirements can not be appreciated.

A procedure of auction needs a very careful preparation.

There can not be factors taken into account in advance.

The conditions of an auction can not be changed during the procedure.

Methodology of auction

The frequency blocks have special structure, they are not independent of each other.

Special auction method:

parallel (simultaneous) auction

Nobel Prize – John Charles Harsanyi (1994)

Equilibrium analyzis at non-cooperative games

- ❖ Auction with more objects
- ❖ Relation among objects
- ❖ All objects are in the auction at the same time
- ❖ Auction is completed when new bids do not arrive in two consecutive turns
- ❖ Simultaneous auction results in optimized structure

Parallel auctions

Special auctioning method:
parallel (simultaneous) auction

By its instrumentation

- by envelope

participants submit their bids in envelope in each turn

- electronic

it needs a complicated and customized (expensive) software

By the location of the procedure

- auction at one place
- remote-auction

After tender or auction

The right of frequency use is valid for a long time (15 … 25 years), the condition of use may change during this time.

Changes can be in the regulation during this time.

They must be validated.

Possibility of transfer:

secondary spectrum trading

Regional (smaller then countrywide) allotment:

The primary possessive of frequency is responsible for handling of internal disturbances.

End of Part 2

Thanks for the attention!

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Economic & human themes

Digital Single Market ongoing process in EU

Zsuzsanna Kósa PhD

BME Dept. Telecommunications and Media Informatics

Budapest, 2018

Strategy level of DSM

A Digital Single Market (DSM) is one in which the **free movement of** persons, services, capital & **information** is ensured.

Individuals and businesses can seamlessly access and exercise online activities

- under conditions of fair competition,
- a high level of consumer protection,
- and personal data protection,

irrespective of their nationality or place of residence.

The Digital Single Market Strategy is built on three pillars:

1. Access: better access for consumers and businesses to digital goods and services across Europe;
2. Environment: creating the right conditions and a level playing field for digital networks and innovative services to flourish;
3. Economy & Society: maximising the growth potential of the digital economy.

The Digital Single Market strategy, adopted on the 6 May 2015, includes 16 initiatives to be delivered by the end of 2016.
https://ec.europa.eu/digital-single-market/en/digital-single-market

Pillar I: Better access for consumers and businesses to digital goods and services across Europe

1. rules to make **cross-border e-commerce** easier
2. to **enforce consumer rules** more rapidly and consistently, by reviewing the Regulation on Consumer Protection Cooperation
3. more efficient and affordable **parcel delivery**
4. to **end unjustified geo-blocking** – a discriminatory practice used for commercial reasons…
5. to identify **potential competition concerns** affecting European e-commerce markets.
6. a modern, more European **copyright law**
7. a review of the **Satellite and Cable Directive** to assess.. how to boost cross-border access to broadcasters' services in Europe.
8. to reduce the administrative burden businesses face from **different VAT regimes**..

Pillar II: Creating the right conditions and a level playing field for digital networks and innovative services to flourish

9. present an ambitious overhaul of **EU telecoms rules.**

- more effective spectrum coordination,
- common EU-wide criteria for spectrum assignment at national level;
- creating incentives for investment in high-speed broadband;
- ensuring a level playing field for all market players, traditional and new;
- and creating an effective institutional framework.

10. review the **audiovisual media framework**

- to new business models for content distribution

11. comprehensively analyse the role of **online platforms** (search engines, social media, app stores, etc.) in the market.

12. reinforce trust and security in digital services, notably concerning the handling of **personal data**. Building on the **new EU data protection rules..**

13. propose a partnership with the industry on **cybersecurity** …

Pillar III: Maximising the growth potential of the digital economy

14. propose a **'European free flow of data initiative**' to promote the free movement of data in the European Union. …

- The Commission will also launch a **European Cloud initiative** covering certification of cloud services, the switching of cloud service providers and a "research cloud".

15. define priorities for **standards and interoperability** in areas critical to the Digital Single Market, such as

- e-health,
- transport planning
- energy (smart metering).

16. support an **inclusive digital society** where citizens have the right skills to

- seize the opportunities of the Internet and boost their chances of getting a job.
- A new e-government action plan will also ***connect business registers*** across Europe,
- ensure businesses and citizens only have to communicate their ***data once to public administrations***,
- The **roll-out of e-procurement** and **interoperable e-signatures** will be accelerated.

Consultations_1

- Fake news and online disinformation
- Europeana digital platform for cultural heritage
- Review of the Directive on the reuse of public sector information
- Transformation of Health and Care in the Digital Single Market
- High Performance Computing initiative in Europe
- Database Directive: Application and impact
- Modernising the regulations establishing the .eu top-level domain name
- Review of the Significant Market Power (SMP) Guidelines
- ENISA evaluation and review
- Building the European data economy
- Mid-term evaluation of the Connecting Europe Facility (CEF)
- Consultation on the Next generation Internet
- Public consultation on safety of apps and other non-embedded software not covered by sector-specific legislation (such as medical devices or radio equipment)

Consultations_2

- Targeted consultation on a co-ordinated introduction of 5G networks in Europe
- Evaluation and review of the e-privacy directive
- Revision of the European Interoperability Framework
- Public consultation on the role of publishers in the copyright value chain and on the 'panorama exception'
- Evaluation of Commission Recommendation 2009/396/EU on the Regulatory treatment of fixed and mobile termination rates in the EU
- Roadmap to the EU-US Memorandum of Understanding on eHealth
- Public-private partnership on cybersecurity
- Review of national wholesale roaming markets, fair use policy and the sustainability mechanism referred to in the Roaming Regulation 531/2012 as amended by Regulation 2015/2120

Consultations_3

- eGovernment action plan 2016-2020
- Online platforms, cloud & data, liability of intermediaries, collaborative economy
- ICT Standards
- Tackling unjustified geo-blocking
- Public Consultation on cross-border parcel delivery
- Legislative proposals to reduce the administrative burden on businesses arising from different VAT regimes
- Evaluation and review of the regulatory framework for electronic communications networks & services
- The needs for Internet speed and quality beyond 2020
- Review of the Satellite and Cable Directive
- The revision of the Audiovisual Media Services Directive
- Contract rules for online purchases of digital content and tangible goods

NIS Directive

The Directive on security of network and information systems (the NIS Directive) was adopted by the European Parliament on 6 July 2016. The Directive entered into force in August 2016.

Member States will have 21 months to transpose the Directive into their national laws and 6 months more to identify operators of essential services.

http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.194.01.0001.01.ENG&toc=OJ:L:2016:194:TOC

ENISA

Summary report on the public consultation on the evaluation and review of the European Union Agency for Network and Information Security (ENISA) https://ec.europa.eu/digital-single-market/en/news/summary-report-public-consultation-evaluation-and-review-european-union-agency-network-and

ENISA was set up in 2004 with the overall goal of ensuring a high level of network and information security within the EU. ENISA's mandate expires in 2020.

Buliding the European Data Economy

The value of the EU data economy:

- was €300 billion representing 1.99 % of the GDP in 2016.
- yearly growth rate is 5.03 %,
- European data economy may increase to €739 billion by 2020, representing 4% of the overall EU GDP.

https://ec.europa.eu/digital-single-market/en/policies/building-european-data-economy

NEW EU COM(2018) 232 final
Brussels, 25.4.2018

„Towards a common European data space"

Commission proposes a common data space in the EU, that will enable the development of new products and services based on data.

Copyright Directive in the DSM

…**Harmonisation of the laws** of the Member States on copyright and related rights…

…**stimulates** innovation, creativity, **investment and production** of new content, also in the digital environment…

…respecting and promoting **cultural diversity** while at the same time bringing the **European common cultural heritage…**

New business models and new actors continue to emerge.

In the fields of research, education and preservation of cultural heritage, digital technologies permit new types of uses…

exceptions or limitations for uses of text and data mining technologies in the field of scientific research, illustration for teaching in the digital environment and for preservation of cultural heritage should be introduced.

Digital exclusion

Digital exclusion is part of the overall challenge of exclusion, a widespread and growing phenomenon which carries with it a series of deteriorations in life paths like poor health, poor lifelong earnings and an **increased risk of marginalisation**.

There are persons currently **excluded for reasons** of

- low income
- low education,
- location,
- culture,
- trust and confidence levels
- various disabilities.

80 million Europeans never use internet either because they don't have a computer or it is too expensive.

Another reasons might be that they find it too difficult or not relevant to connect digitally as observed in the Digital Scoreboard.

An important factor is the type or level of cognitive or physical disability that prevents those affected to use ICT and Internet.

Digital Inclusion

Digital inclusion is being made possible through some of the acitivities supported by the European Commission such as :

- **Accessible ICT:** making ICT more accessible for all and fostering new methodologies for technology development (design for all)
- **Assistive technologies:** supporting the development of ICT that assists people with disabilities for enabling them to perform activities that they have not been able to do before and to interact better with technologies.
- **Skills and digital skills:** empowering citizens to fight marginalisation and social exclusion, including careers through ICT in Education.
-

- **Social Inclusion:** increasing the participation rate of disadvantaged people in public, social and economic activities through social inclusion projects.
- There are a number of **EU funded projects** that address the needs of disabled people.
- The Commission's actions particularly addresses people with physical and cognitive **disabilities,** youth and the **NEETs** (Not in Employment, nor in Education or Training), the economically inactive, immigrants and the elderly through the **Active and Assisted Living Programme.**

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Regulation for Content Provision

Zsuzsanna Kósa PhD

BME Dept. Telecommunications and Media Informatics

Budapest, spring of 2018

Content holders

Archaic content holders for thousand years

- Oral tradition
- Paintings, ceramics, paintings on the wall, stones
- Papirus,…

Traditional content holders 50-200 years

- Paper for texts or drawings
- photo (papers + chemical process)
- celluloid movie *(it has been changed)*
- analogue videofile *(it has been changed)*

Each content holder has different durability

Electronic content holders for shorter run (1-5-10 years)

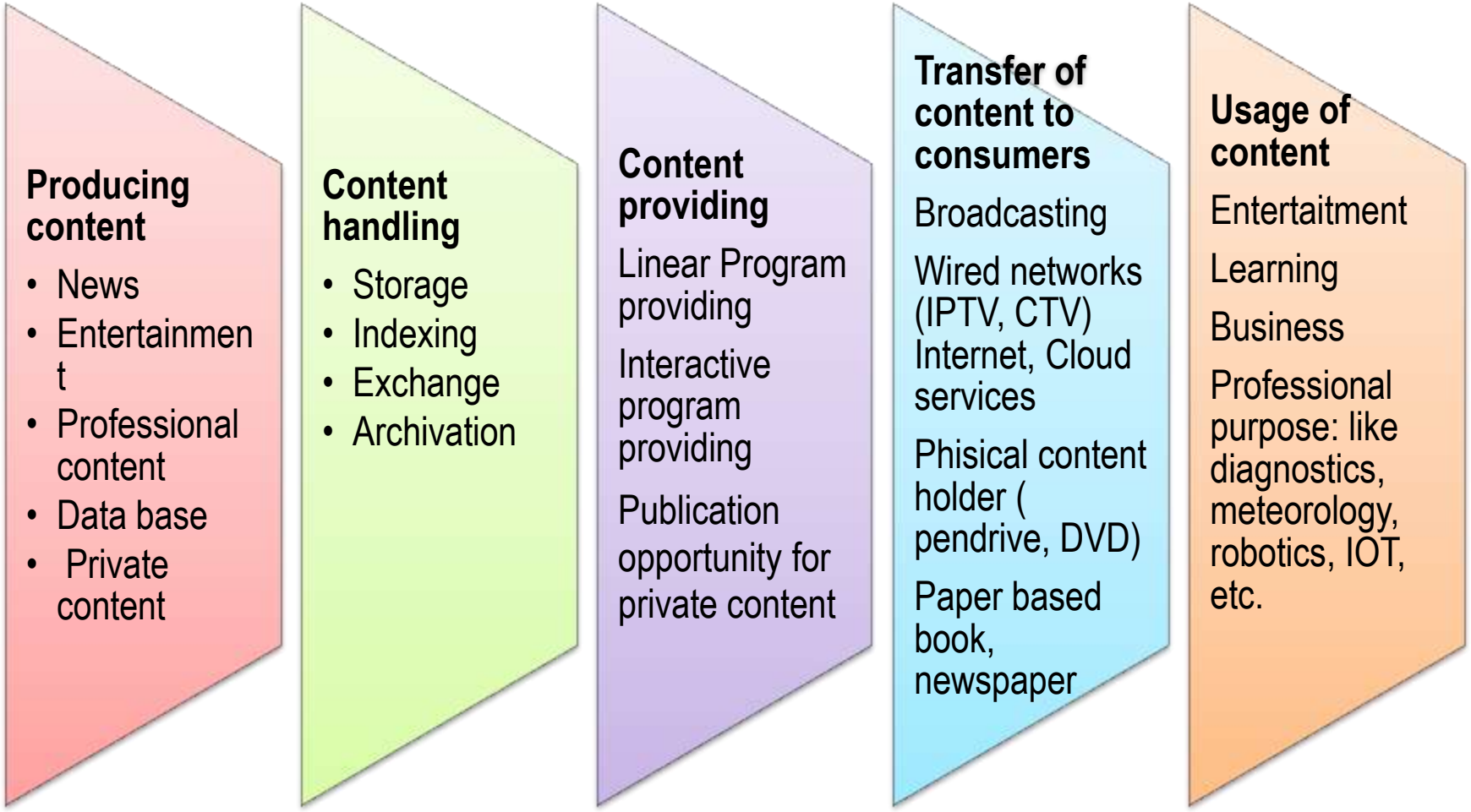
- Digital formats for texts, pictures and media
- These formats are digital and standardized
- Electronic content can be transferred and indexed or searched easily

Coding and decoding:

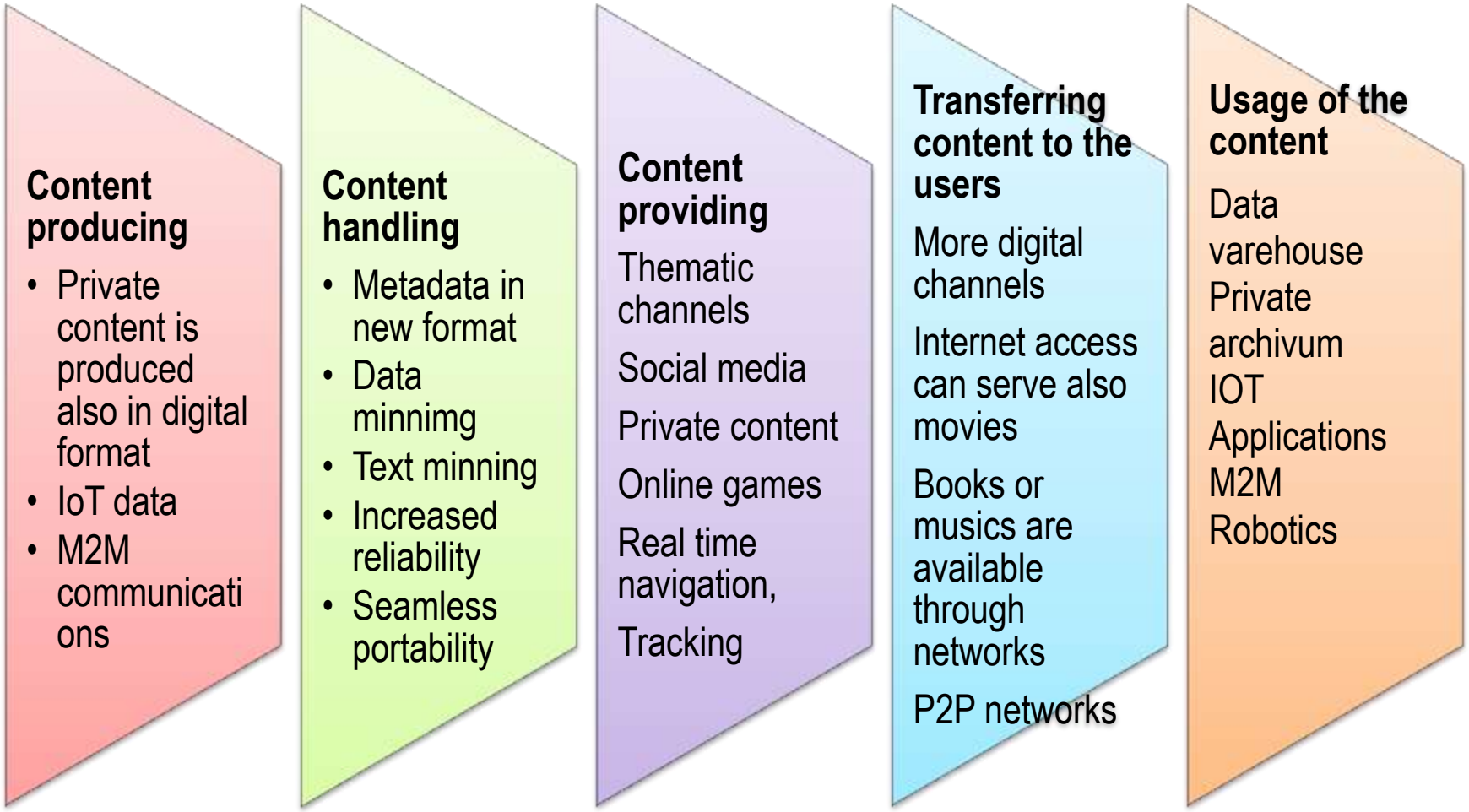
The content is coded and decoded by

- Signs (ABC or drawings, hieroglifs)
- Languages (by nations / nationalities)
- Meanings (it may change in time)
- Associations (symbols & belives)

Industrial value chain in content providing



New technologies and tendencies



Regulation of media content

Regulation in general depends on

- National & regional culture
- Politicals system
- Economic situation
- Technical opportunities
- International agreements

EU regulation of broadcasted content:

- Based on directives
- Fulfilles the freedom of moving ideas across national borders
- Avoid rassism
- Try to be balanced politically
- Expect a minimum ratio of european made content in a bradcasted TV- or radio- program

https://ec.europa.eu/digital-single-market/en/revision-audiovisual-media-services-directive-avmsd

Detailed rules of media content providing

- How to deffend children from agression and adult content
- Regulate advertisement of medicines, drogs, cigaretts, alcocholic drinks
- How to separate news and opinions
- How to serve distance purchasing in TV shops
- How to serve disabled persons in media
- How to get sponsorship in media
- How to handle extra situations, like industrial disaster

Study to prepare European legislation:
Competition Law and Pluralism in European Digital Broadcasting: Addressing the Gaps
Mónica ARIÑO, European University Institute, Florence
http://www.academia.edu/1050018/PLURALISM_IN_DIGITAL_BROADCASTING_MYTHS_REALITIES_AND_THE_BOUNDARIES_OF_EUROPEAN_INTERVENTION

New approaches at Audio Visual Media Services Directive

Proposed changes in AVMSD from 2010-2017

The Country of origin principle (COO)

Commercial Communications

Promotion of European works

Prohibition of hate speech

- The grounds for prohibiting hate speech… This prohibits incitement to violence and hatred directed against a group of persons or a member of such a group defined by reference to sex, race, colour, religion, descent or national or ethnic origin.

Protection of Minors

- …aim at simplifying the obligation to protect minors against harmful content….
- Member States shall ensure that audiovisual media service providers provide sufficient information to viewers about harmful content to minors. …

Platforms

- Video-sharing platforms will be included in the scope of the AVMSD only when it comes to combat hate speech and dissemination of harmful content to minors.
- Platforms which organise and tag a large quantity of videos will have to protect minors from harmful content …

The Audiovisual Regulators

ERGA (The European Regulators Group for Audiovisual Media Services)

https://ec.europa.eu/digital-single-market/en/revision-audiovisual-media-services-directive-avmsd

EU legislative framework for telecommunication networks

Directive 2002/21/EC …on

a common regulatory framework for electronic communications networks and services ("Framework Directive")

Ammendments:

Regulation (EC) No 717/2007

Regulation (EC) No 544/2009

Directive 2009/140/EC

Regulation (EC) No 1211/2009..

establishing the Body of European Regulators for Electronic Communications (BEREC) and the Office (Text with EEA relevance).

Telecommunication infrastructure is highly regulated for content handling

Directive 2009/136/EC …amending Directive 2002/22/EC

on universal service and users' rights relating to electronic communications networks and services,

Directive 2002/58/EC **concerning the processing of personal data and the protection of privacy in the electronic communications sector**

and Regulation (EC) No 2006/2004 on **cooperation between national authorities responsible for the enforcement of consumer protection laws** (Text with EEA relevance)

2015/0287 EU Directive on Digital content _*approach*

„The growth potential of e-commerce has not yet been fully exploited."

- **Consumers** are not confident when buying cross border and especially online; they will benefit from fully harmonised rights for digital content
- **Traders** willing to sell cross-border face uncertainty, they will have a stable contract law environment when selling online and fully harmonised rules for the supply of digital content .

- Directive should **not affect national laws t**o the extent that the **topics** concerned are not regulated…
- The Directive should apply to all digital content **independently of the medium used** for its transmission.. supplied on a durable medium, independently whether it is sold at a distance or in face-to-face situations…

Brussels, 9.12.2015
http://ec.europa.eu/justice/contract/files/directive_-digital_content.pdf

2015/0287 EU Directive on Digital content _*private content*

Freemium model is regulated

- „applicability of the rules of this Directive should **not depend on whether a price is paid** for the specific digital content …"

Privacy should be deffended:

- „ Directive should apply only to contracts where the **supplier requests** and the **consumer** actively provides data, such as **name and e-mail address or photos… „**

Private content should be kept:

- **Content generated by consumers** should be treated on the same basis as any other digital content …(during) the period of duration of the contract such as music and video files, pictures, games or applications.

http://ec.europa.eu/justice/contract/files/directive_-digital_content.pdf

2015/0287 EU Directive on Digital content _*innovative technologies*

3D printing

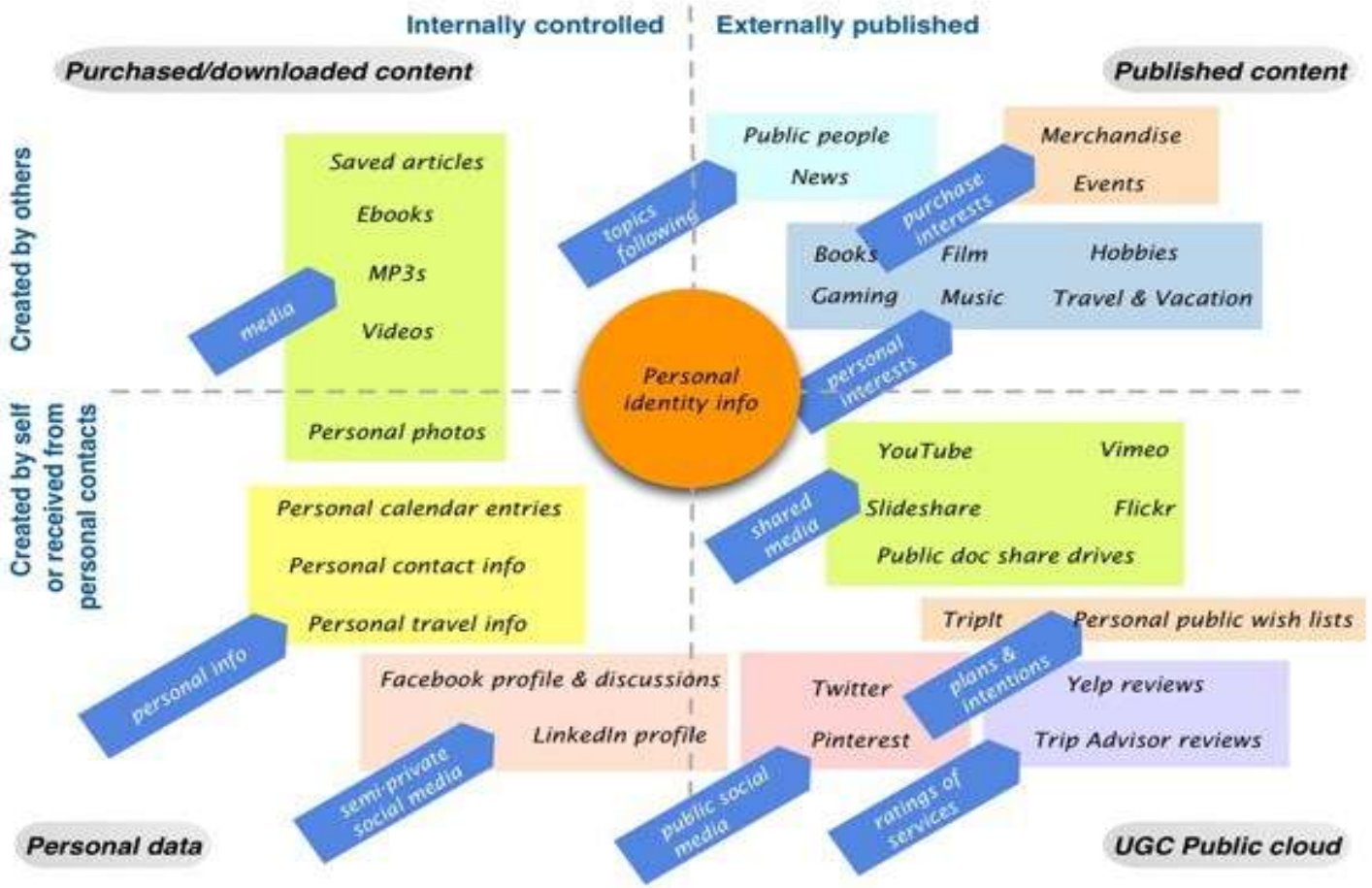
- This Directive should also apply to the supply of visual modelling files required in the context of 3D printing.
- However this Directive should not regulate goods produced with the use of 3D printing technology or the damage caused to them.

Internet of things, M2M

- Digital content is highly relevant in the context of the Internet of Things. However it is opportune to address specific issues of liability related to the Internet of Things,
- including the liability for data and machine-to-machine contracts, in a separate way.

http://ec.europa.eu/justice/contract/files/directive_-digital_content.pdf

Content categories in a cloud era



http://storyneedle.com/metadata-standards-and-content-portability/

Content portability is regulated in EU

❖„ Seamless access to online content services by consumers throughout the Union is important for the smooth functioning of the **internal market….”**

❖„…consumers can use **portable online content services** which offer access to content such as music, games, films or sporting events not only in their Member State of residence but also when they are temporarily present in other Member States of the Union …”

Regulation… on ensuring the cross-border portability of online content services in the internal market (26 May 2016)

http://www.consilium.europa.eu/en/press/press-releases/2016/05/26-portability-digital-content/

(This regulation should be transposed into national legal system soon.)

Regulation of privacy deffence and being informed as public interest

Privacy is a right to have authority over personal data, independently from the data handler

This is not same as data security,

Data security is needed to achieve privacy

Personal data are to be handled only with the agreement of the natural person

Data for public interest are all data which is related to government activities & public services

It should be published on the web, without any personal registration

The governmental institutions should publish it in the same format

Privacy regulation in EU

On 4 May 2016, the official texts of the Regulation and the Directive have been published in the EU Official Journal in all the official languages.

- While the **Regulation** will enter into force on 24 May 2016, it shall apply from **25 May 2018**.
- The **Directive** enters into force on 5 May 2016 and EU Member States have to transpose it into their national law by **6 May 2018**.

http://ec.europa.eu/justice/data-protection/

Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.119.01.0001.01.ENG&toc=OJ:L:2016:119:TOC

Directive (EU) 2016/680 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework Decision 2008/977/JHA http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.119.01.0089.01.ENG&toc=OJ:L:2016:119:TOC