Engineering Management BMEVITMMB03

# REGULATORY PRINCIPLES
# Concepts, models and methods


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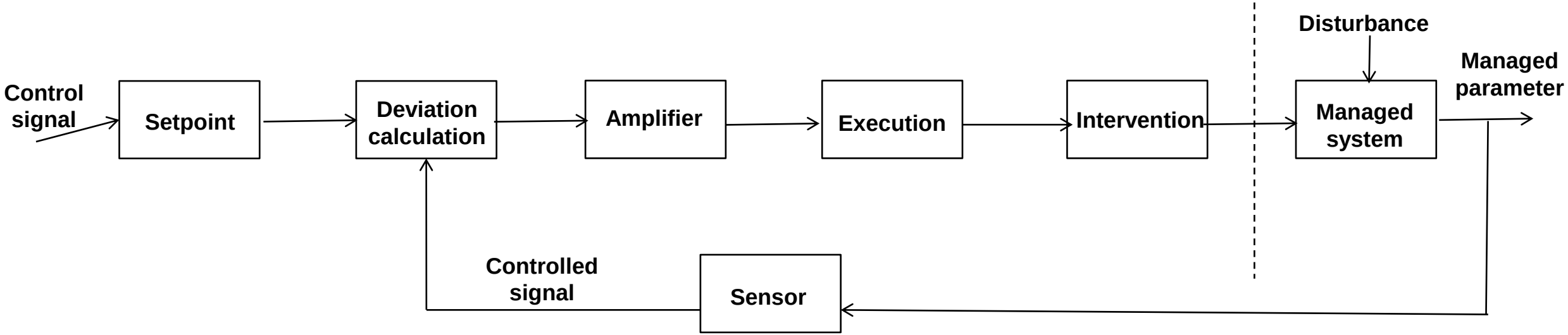
# CONTROL vs REGULATION

## In the engineering the processes can be managed by:

- *Non-reactive, open loop control:* there is no feedback loop, the intervention is predetermined
- *Closed loop control:* there is feedback loop to adjust/decrease the deviation from a given input value.



# CONTROL vs REGULATION

## In the engineering process control

- The parameters are accurately measurable in general
- The rate of the feedback can be adjusted
- The system consists of finite unites and mostly of units with deterministic behaviour (the exception to this is the world of stochastic processes)
- The feedback loop is manageable.

**In practice this control theory cannot be transferred to management (regulation) of the social and economic processes**
**Why?**

# COMPLEXITY OF THE STATE REGULATION

**The concept of state regulation:**

The intervention of the state for the public interest.

Community objectives considered to be public interest, but:

- They are changing in space and time
- Social groups have different perceptions of the public interest
- Society is a very complex system, and regulatory intervention is needed in many areas
- The regulation of each area also interacts
- The processes are difficult to measure, and the effects are often not even quantifiable.

The state regulation basically depends on the state, so there are several models that fundamentally determine the nature of interventions.

# STATE REGULATORY MODELS

**Before the formation of the modern state** (until the end of the 19th century):
The state preferably refrained from interfering in the economy.

**After the formation of the modern state:**
Intervention is needed from different societal, social and competitiveness aspects.
Confirmatory events:

- ♦ World wars
- ♦ Economic crises
- ♦ Intensifying economic competition
- ♦ Disintegration of colonial empires
- ♦ New World Economic System, 1947

**Types of regulatory models:**

- ❖ Direct economy model: Socialist planned economic model, Controlled economic systems
- ❖ Market economy model - we will deal only with in detail

# MARKET ECONOMY MODEL (1/3)

- It would be based on perfect competition - but there is none
- The aim of state intervention is to approach perfect competition
- An imperfect market economy brings market failures
- The task of state intervention is therefore to positively offset market failures: Two theories:
  - Welfare state: The focus should be on prosperity.
  - Lassies-faire doctrine:

    Only and exclusively the rule of law and public order, protection of property, defence, provision of public goods, breaking of monopolies, suppression of anti-competitive behaviour.

# MARKET ECONOMY MODEL (2/3)

## PERFECT COMPETITION (ideal)

- No actor has a price-influencing effect
- The allocation of resources is completely efficient

## Conditions:

- Homogeneous product (consumer choice is indifferent)
- Price acceptance (only determined by the market)
- Free entry into and exit from the market
- There are no externalities
- There are no transaction costs
- Perfect divisibility of output
- The perfect information

## The Pareto-optimality is created*

- The theoretical maximum of welfare: it is no longer possible to increase anyone's well-being without harming others.

** Vilfredo Pareto's analyses underpinned welfare economics.*

# MARKET ECONOMY MODEL (3/3)

## IMPERFECT COMPETITION (market failures)

There are three forms:

- Monopoly
- Oligopoly
- Monopolistic competition

## External economic effects (externalities)

Externalities cause harm or benefit, but are not built into the price of the product.

- Negative externalities (e.g. environmental damage, the effects of high energy demand, chemicals, etc.)
- Positive externalities (e.g. creating benefits for other industries, such as communications)

## Public utilities, public goods

- Public utilities: market-based public services, the consumer can be excluded
- Public goods: everyone benefits from it (e.g. road network)

# PURPOSE OF THE REGULATION IN GENERAL

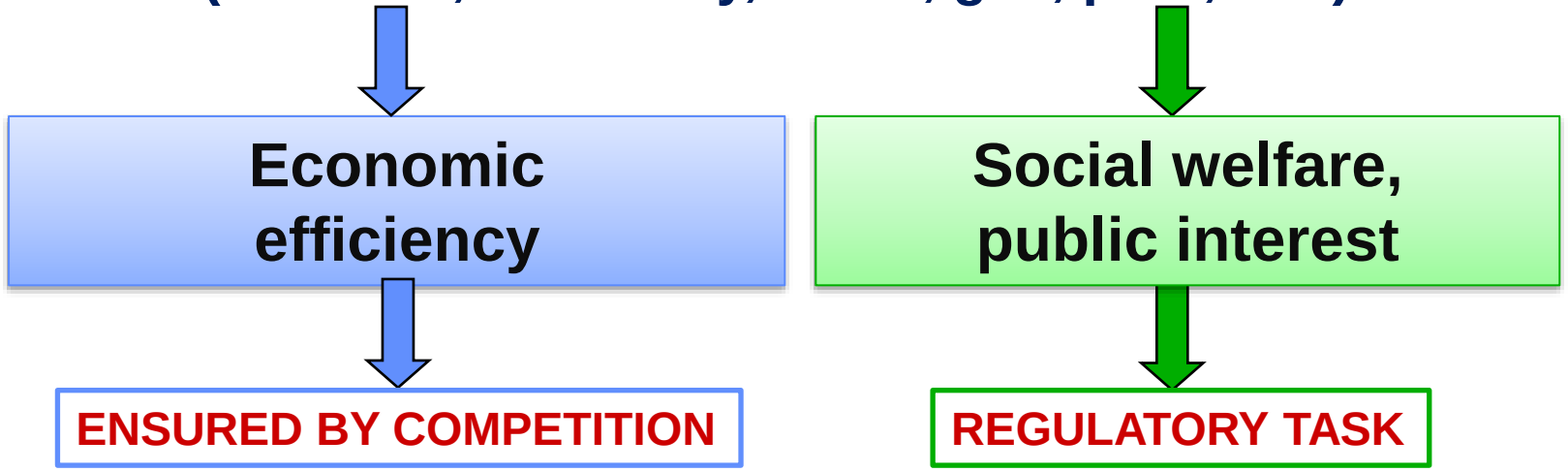
Regulatory aim is to balance the effects of market failures

Regulator's intervention can be targeted at:

- To compensate for imperfect competition
- To alleviate distortions caused by external externalities
- To support public service priorities
  (must work in all conditions)
- To create the public good (social goals and political expectations may also appear here)

# WHY TO REGULATE PUBLIC UTILITIES ?

**To provide public utilities in a balanced way to the public**
**(telecom/, 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

# LEGAL STATUS OF REGULATION

## National level: Legislation

At the level of laws:

- Political deliberation/ intentions
- Directions, frames

At the level of decrees:

- Determining implementation
- Defining details


## Application of legal framework: Regulation

- Rule making: Professional solutions within the legal framework
- Activity of Authority: Ad hoc application of laws and regulations, control, enforcement
- Legislative preparation

# LEGAL FRAMEWORK of EUROPEAN UNION

## EU's Primary laws:

**EU treaties:** are binding agreements between EU countries

## EU's Secondary laws:

**Regulations:** automatically and uniformly applicable in all EU countries, binding, not transposable, directly effective

**Directives:** must be transposed into legal framework of EU countries, and implemented (usually 2 years), information of European Court, infringement proceedings

**Decisions:** covers one or more countries, some businesses or individuals.

# LEGAL FRAMEWORK of EUROPEAN UNION (cont.)

## EU's further secondary laws:

**Recommendations:** Communication of position, proposals for action – optional

**Opinions:** Resolution of the EU institutions - non-binding

**Delegated acts:** Binding act if the European Commission supplements or amends a non-essential element of the EU legislative acts.

**Implementing acts:** Binding act if the European Commission wants to ensure that EU law is applied uniformly in all countries

# EUROPEAN LEGAL ENVIRONMENT

**Primary laws:**

- Treaties (Treaty of Rome, Maastricht, etc.)

**Secondary sources of law:**

- Regulations, Directions, Decisions, Recommendations, etc.

**EU institutions:**

- European Commission
- European Parliament (representation of citizens)
- European Council (representation of Member States)
- European Union Council (Council of Ministers, repr. of Member States)
- Permanent Representatives Council (COREPER)
- European Court (interpretation of the EU law,
  legal actions of Member States, EU institutions and EU citizens)
- European Central Bank
- European Court of Auditors
- ...and numerous other Committees, Councils and working groups.

# HUNGARIAN LEGAL ENVIRONMENT from aspect of ICT

**Legal framework**

- Constitution
- Laws
- Government decrees
- Ministerial decrees
- Regulations

In accordance with the principles and implementing rules laid down by legal framework, the State, in the public interest, ensures that certain activities of society are uninterrupted.

**Institutions**

- Constitutional Court — Legal interpretation
- Parliament
- Government — Legislative creation
- Ministries **(Ministry for Innovation and Technology, etc.)**
- Regulatory Authorities (**National Media and Infocommunications Authority,** Competition Authority, Consumer Protection Inspectorate, etc.) — Legislative application, state professional tasks

**Public bodies, social organizations**

- Hungarian Academy of Sciences, Hungarian Standards Board…
- Reconciliation organizations (e.g. Association of IT Enterprises)
- Professional/non-governmental organizations (e.g. Scientific Association for Infocommunications, HTE)

# PRINCIPLES OF ICT 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)

# 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 regulatory authority*):

- not able to handle *market dominance* (SMP)*;*
- not suitable at *public utilities* (can't be stopped);
- improper management of *scarce resources;*
- *externalities* may prevail over market laws

**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 INSTRUMENTS

**Laws** (acts, government and ministerial 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. compliance of services, equipment),
  - handling significant market power violation (ex post),
  - taking sanctions, punishments
- **Dispute resolution:** mediation among market players
  - state administration procedures (Regulatory Authority)
  - judicial proceedings (Court, Supreme Court)

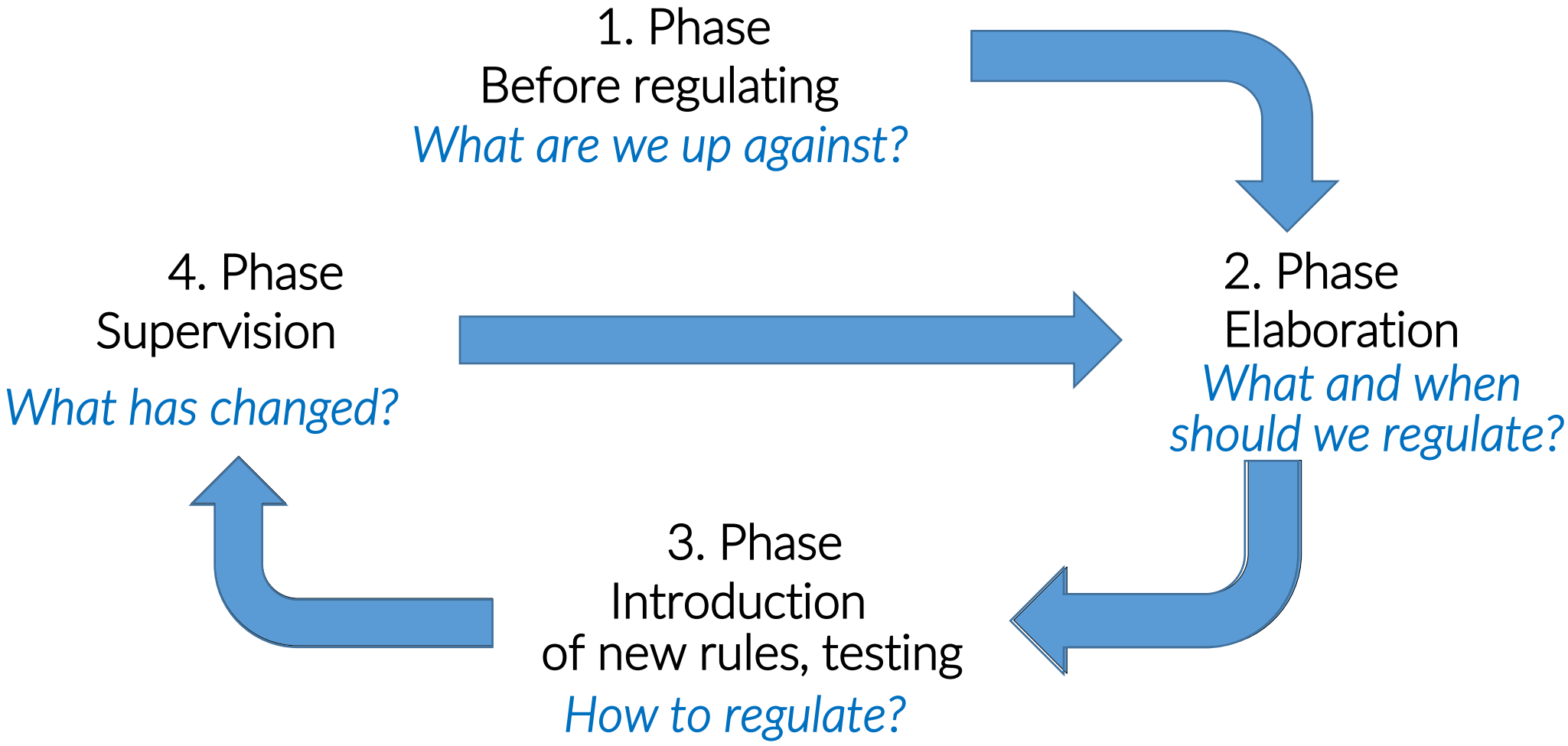
**Self and co-regulation**

- **Self regulation:** reconciliation forum of market players, ethic codex, etc.
- **Co-regulation:** task sharing by market players and authority

# RULE MAKING PROCESS

- **Monitoring:** international trends, EU directives, industry information
- **Regulatory studies, surveys, researches**
- **Principle:** Authorisation to draw up an implementing a regulation;
  e.g. delegation by law, government decree, communication policy, EU regulation, directive etc.
- **Elaboration:**
  **Technical:** system modelling
  **Economic:** market modelling (no specific actors)
  **Legal:** legal harmonisation, codification
- **Consultation:** Stakeholder involvement, conciliation mechanisms, public consultation / debate
- **Finalization and submission for decision**

# PHASES OF REGULATORY PROCESS



# ICT 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, service portfolio, convergence)
- the intensity of the competition, the market structure (oligopoly)
- the changing social demand (e.g. universal telecom services)
- the influence of political power (e.g. addressing government priorities)

**In the ICT regulation 4 periods of the aims and models can be distinguished:**

1. Period of natural monopoly
2. Period of the emergence of competitive environment
3. Period of the expansion of digital/infocommunication convergence
4. Period of advanced information society as a perspective.

# DEVELOPMENT PERIODS OF TELECOM / ICT

| 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. | Infocommunications 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 digital technologies, digitalisation | Smart solutions, IoT, AI applications | Widening market integration, ecosystems | Scarce resources, network dependency, content handling |

**1. Period: until 1990**

# NATURAL MONOPOLY

- Monopoly ensures the economic efficiency
- Only telephone and telegraph services

***Technical regulation:*** Fundamental technical plans

***Economic regulation:*** Model versions:

*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

*Private service providers* (E. g: USA):

Good economic efficiency, but failure to meet social goals and technical compatibility. Independent regulator (FCC, Federal Communications Commission) and market regulation (e.g.: price regulation) have been established.

**Due to technological developments, there is little justification for a natural monopoly, and competition is beginning to be seen as an essential tool for regulation that can also ensure economic efficiency and reasonable prices.**

1. Period

# FUNDAMENTAL TECHNICAL PLANS

## Regulatory tools for the integrity of telecommunications, prescribing:

- the structure of the network
- the rules of traffic routing
- the signalling plan for the cooperation of the exchanges (protocol)
- the synchronisation plan for digital networks
- the transmission plan: permissible attenuation, delay, noise of the transmission paths
- the switching plan: the congestion of the exchanges, etc.
- the reliability and availability plan of the networks
- the security and protection plan of the networks
- permission to place equipment on the market
- authorization to provide services
- numbering plan (number management and allocation)
- frequency plan, frequency management
  - allocation of radio spectrum among the services,
  - regulation of the usage of frequency bands,
  - frequency assignment rules

**2. Period: 1990-2002**

# LIBERALISATION

## Regulator (regulatory authority) has star role:

- ***Facilitates the formation of competition on the market***
  *(liberalization, easier market entry, handling players with SMP significant market power)*
- ***Deployment of universal telecom service***
  *(specification, incumbents, financing):*
  1996 USA Act for universal services
  2002 EC Directive

**More players enter the market, but only limited competition.**

**The intensity of competition** is measured e.g. by market shares:

**1-HHI,** where *Herfindahl-Hirschman Index* (HHI):

HHI = $\sum R_i^2$ , where $R_i$ is the market share of the $i^{th}$ player, $0 < HHI \leq 1$ and $\sum R_i = 1$.

In case of monopoly: HHI=1

US Dept. Justice: the competition is efficient, if **HHI < 0,18**;

i.e. there are at least six competitors and the largest share is less than 40%.

2. Period

# TELECOM SPECIFIC EX-ANTE REGULATORY INSTRUMENTS to strengthen competition

- **simplifying market entry** no exclusivity, only registration
- **transparent, open procedures for the scarce 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)
- **asymmetric regulation**: obligations of service providers with SMP:
  - 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)

3. Period: 2002-2012

# DIGITAL CONVERGENCE

**By virtue of technological development the converging areas require harmonized regulation suitable for the demands of the information society**

## Stages of digital convergence:

Harmonisation and globalisation of regulations

Integration of product markets and organisations

Integrated digital systems, unified network platforms

3. Period

# HARMONISATION OF REGULATION

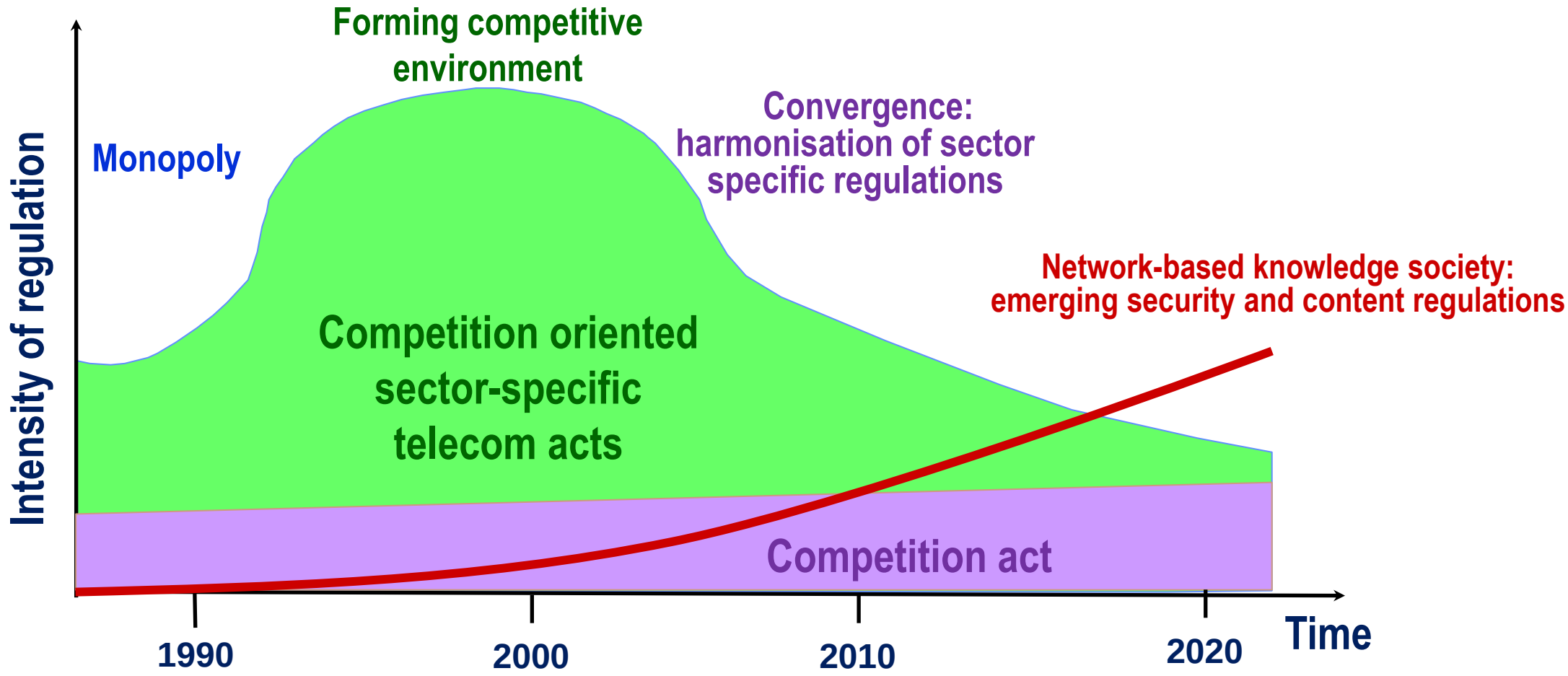
## Regulatory instruments for expanding convergence

- ***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. terrestrial, satellite, PSTN, IP, CATV, broadcasting
  in case of interconnection, carrier selection, number portability, etc.
- ***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
  - reconsideration of personal and intellectual property rights

## 4. Period: present

# REGULATORY TREND

- ***decreasing sector-specific regulations,***
- ***increasing competition regulation,***
- ***emerging security and content regulations***



# AREAS OF ICT REGULATION

- **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 (media regulation)
- **Regulation of market activity**
  - interconnection, access, facility sharing, number portability
  - 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 compliance)
  - Universal telecom service
- **IT regulation** (infrastructure, security, etc.)
- **Content regulation** (media regulation)
- **Regulatory mechanisms, authority procedures**