ENGINEERING MANAGEMENT

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

Prof Gyula Sallai - László Kunsági

BME Dept. Telecommunications and Media Informatics

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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, products and IT support.

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.

Preferred features 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 general: roles and methods
- Strategic management: position analysis, direction statement
- Organisation management: lifecycle and transformation of firms
- Management in practice: organisation culture, leadership
- Enterprise management, resource planning and distribution
- Operation management: business processes, customer relations
- Process management: role of IT in value generation
- Innovation management: models, metrics, organizations
- Product management: development and marketing of products
- Knowledge management: use and protection of intellectual rights
- Regulation of ICT sector: networks, services, market, content
- Competition regulation, customer protection
- International organizations, business and regulation cultures

REFERENCES

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***Bidgoli, H. (ed.).:* The Handbook of Technology Management, 3 Volumes, Wiley, USA, 2010**
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***IDATE:* DigiWorld2009 Telecom, Internet, Media – The digital world's challenges, 2009.**

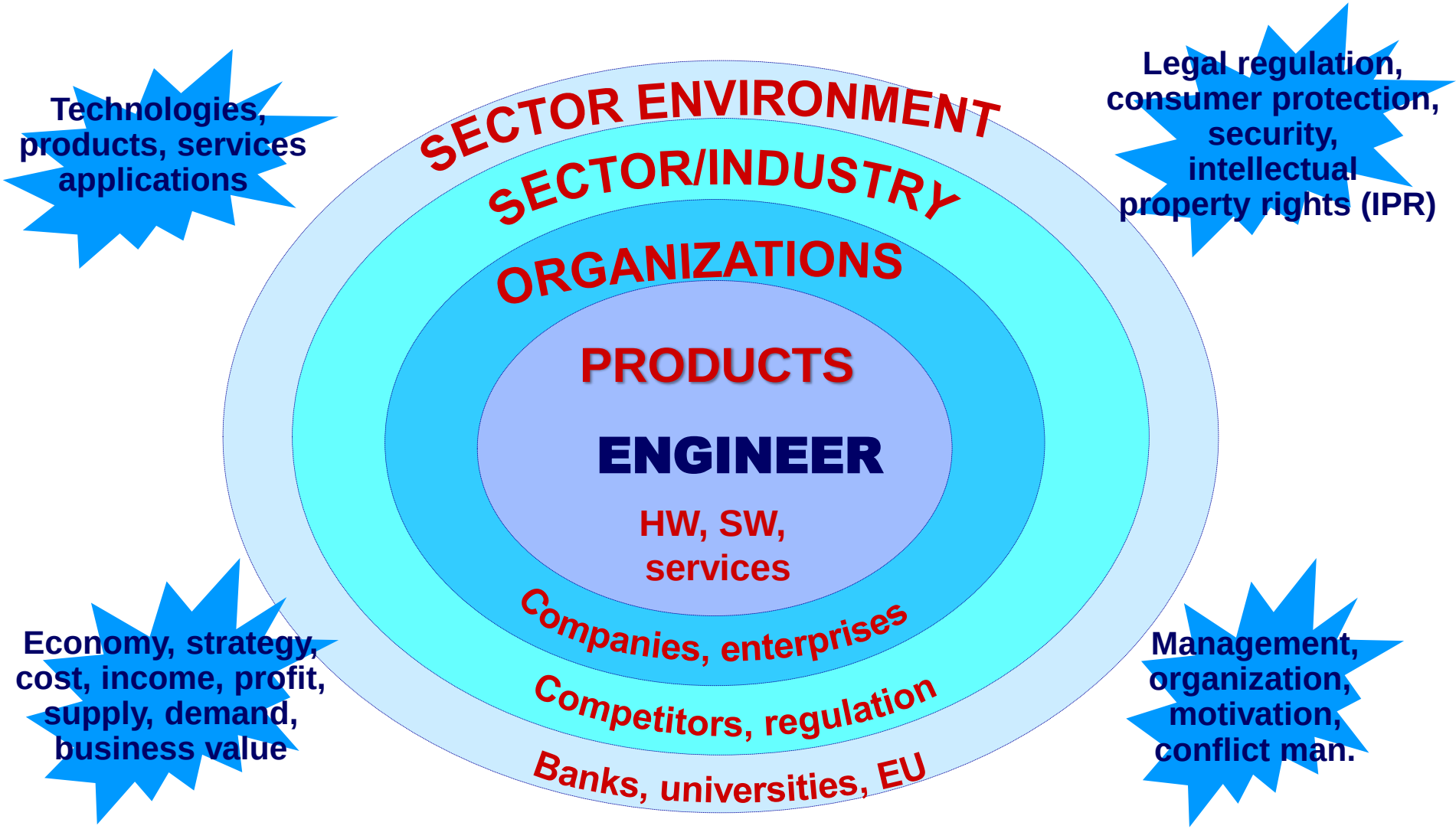
***Dominigue, J. at al* (ed.): The Future Internet - Achievements and Technological Promises, Future Internet Assembly 2011, Budapest, ISBN 978-3-642-20898-0, Springer, Heidelberg (LN in Computer Sciences 6656)**

***World Economic Forum:* Digital Ecosystem – Convergence between IT, Telecoms, Media and Entertainment: Scenario to 2015. World Scenario Series, 2007**

***EITO:* European Information Technology Observatory**

***OECD:* Information Technology Outlook**

ENVIRONMENT OF ENGINEERS
Layers and dimensions



MARKET ENVIRONMENT OF THE ENTERPRISES

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

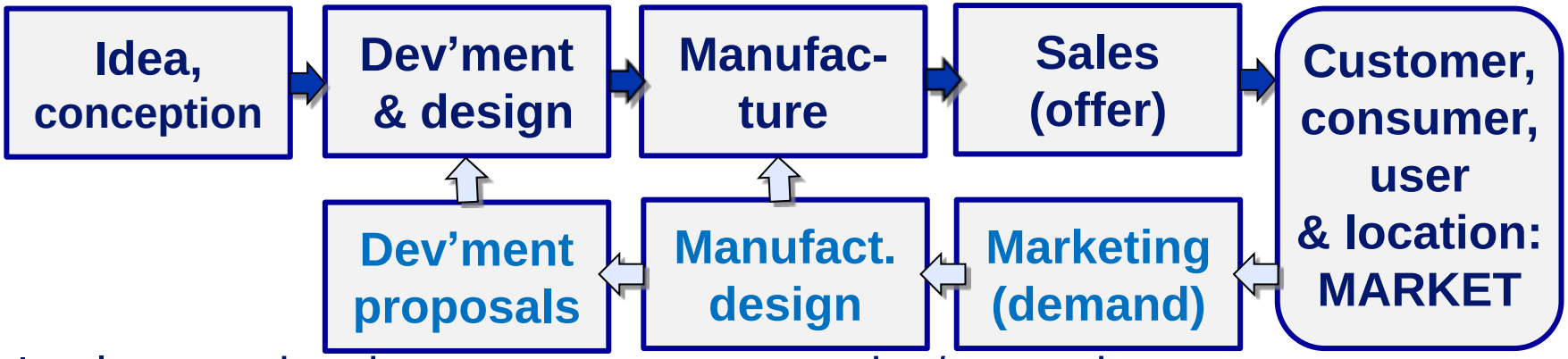
- Customers (demand, shopping power)
- Owners (state, private, national, multinational firms)
- Suppliers (offers, bargaining position)
- Competitors (threats, alliances)
- Cooperative business partners (alliances, subcontractors)
- Employees (knowledge, capabilities, attitude, atmosphere)
- R&D&I organizations (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

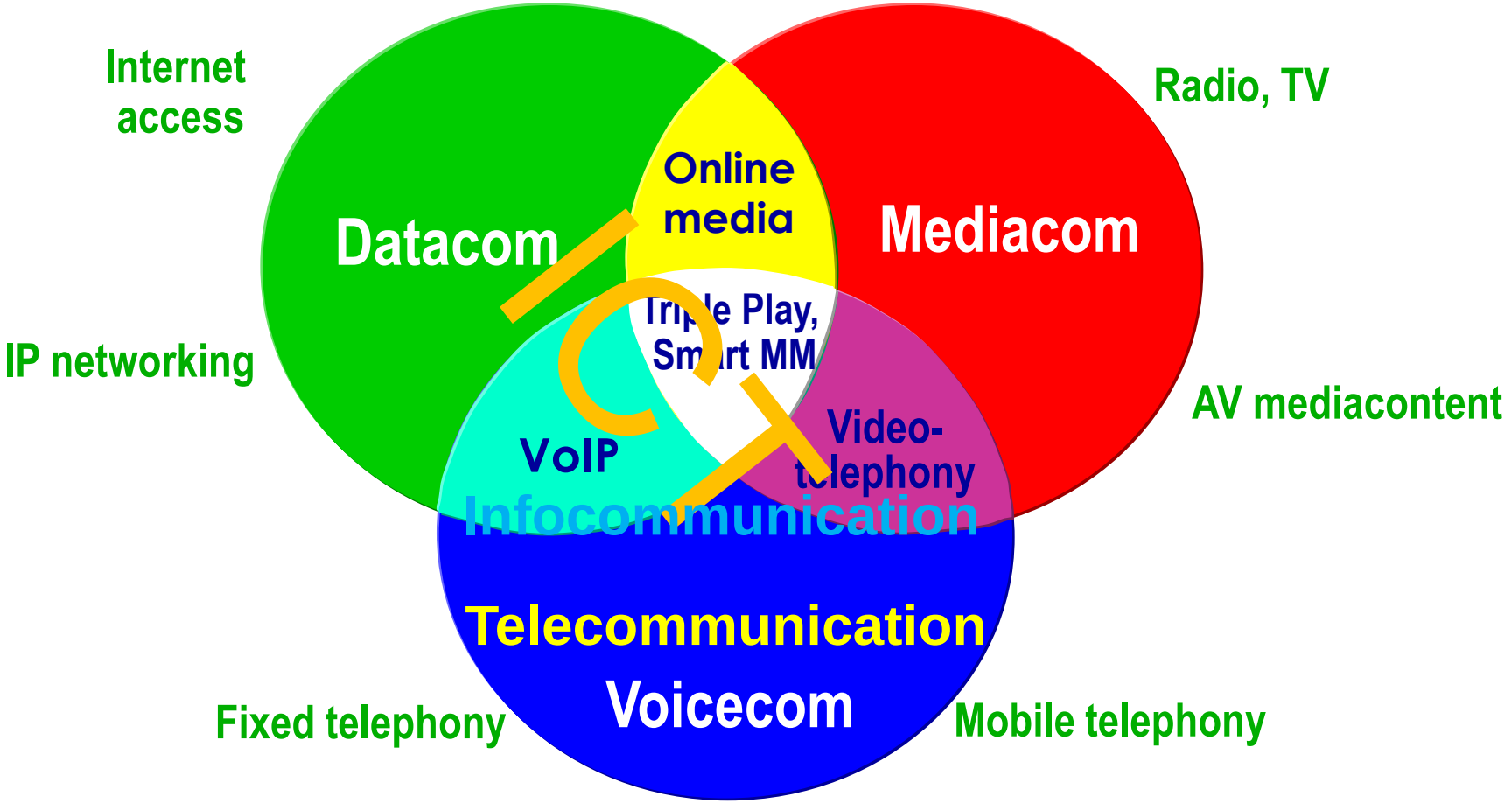
Common technology

- 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



TIM > ICT> Infocommunication > Telecommunication

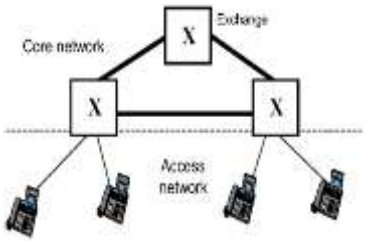
Phases of digital convergence

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

Communications sectors separated by content

Digitization and integration of network functions sector by sector

2

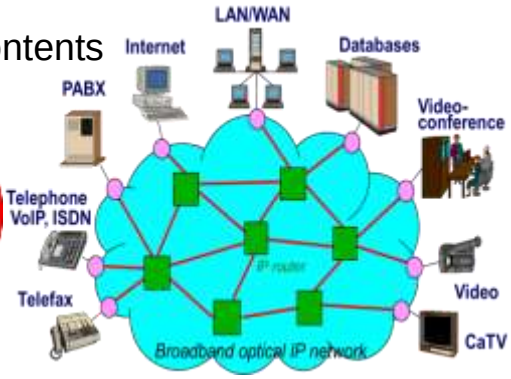
Electronic communications sector

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

3

Infocommunications (ICT, TIM) sector

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



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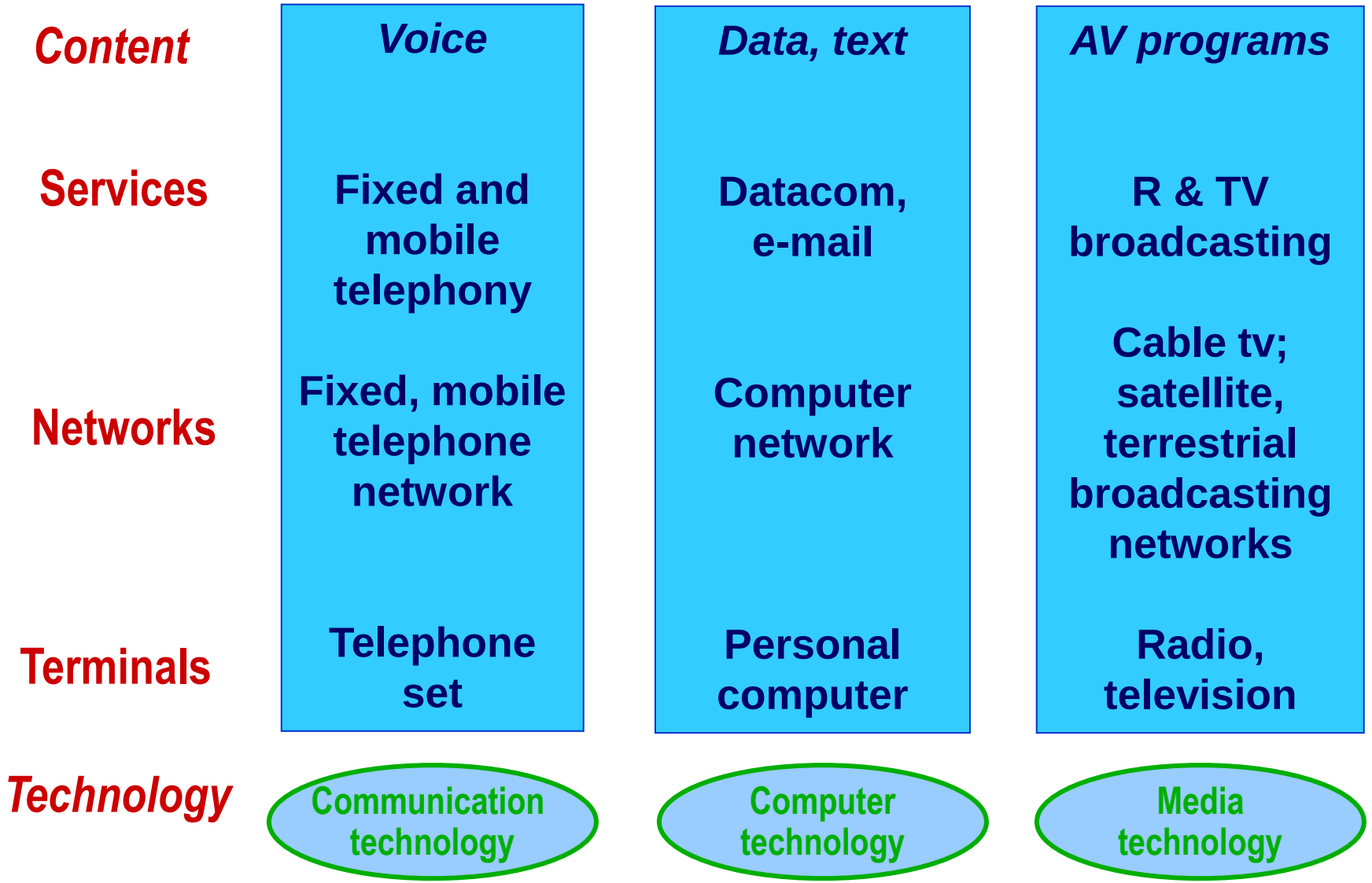
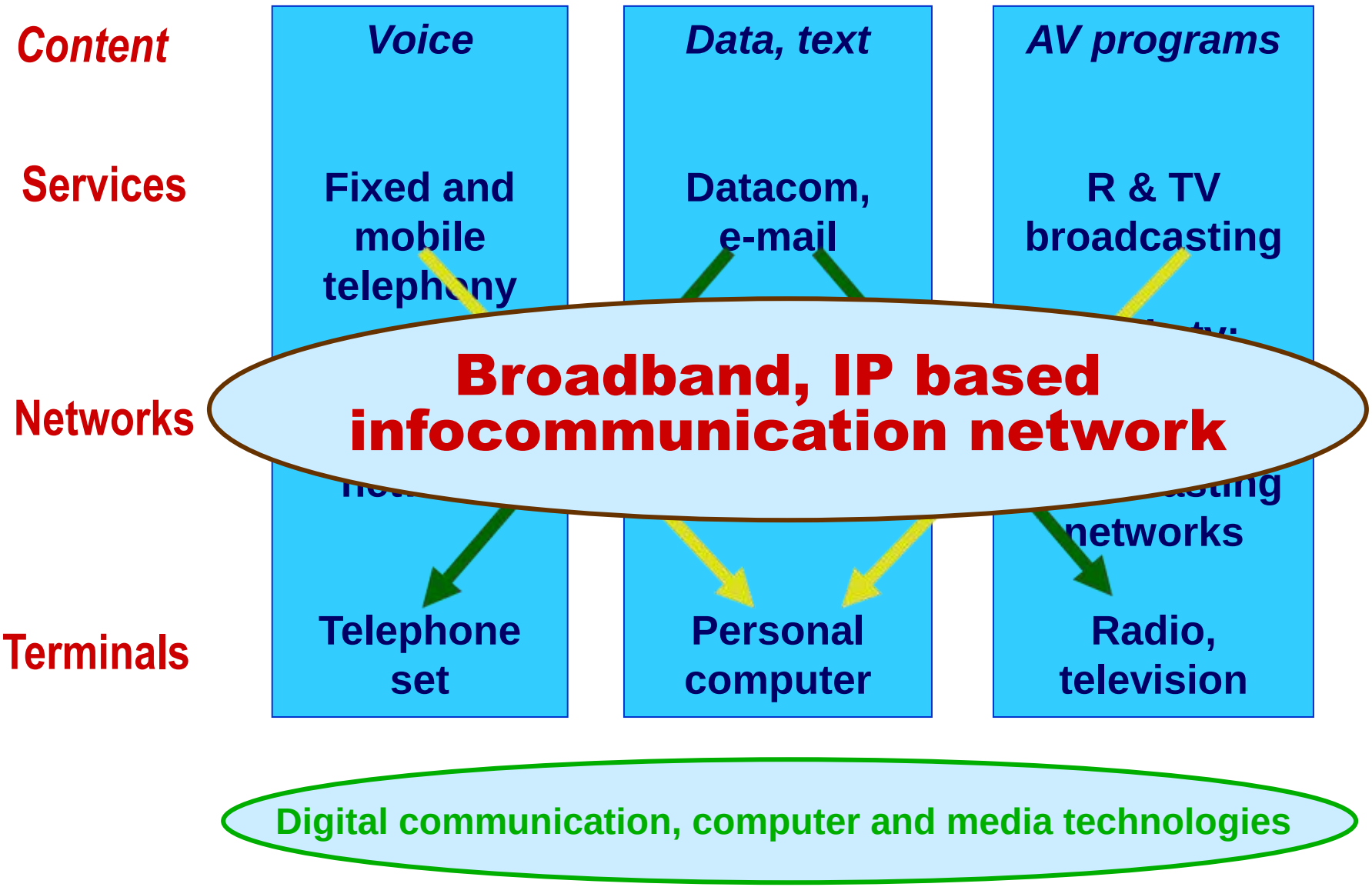
It transforms business and bank spheres, administrations, health-care, transportation, education, knowledge systems,
our every day life:
Future information and communication society, Digital Age
is Internet-based, but limitations of current Internet must be eliminated :
Future Internet

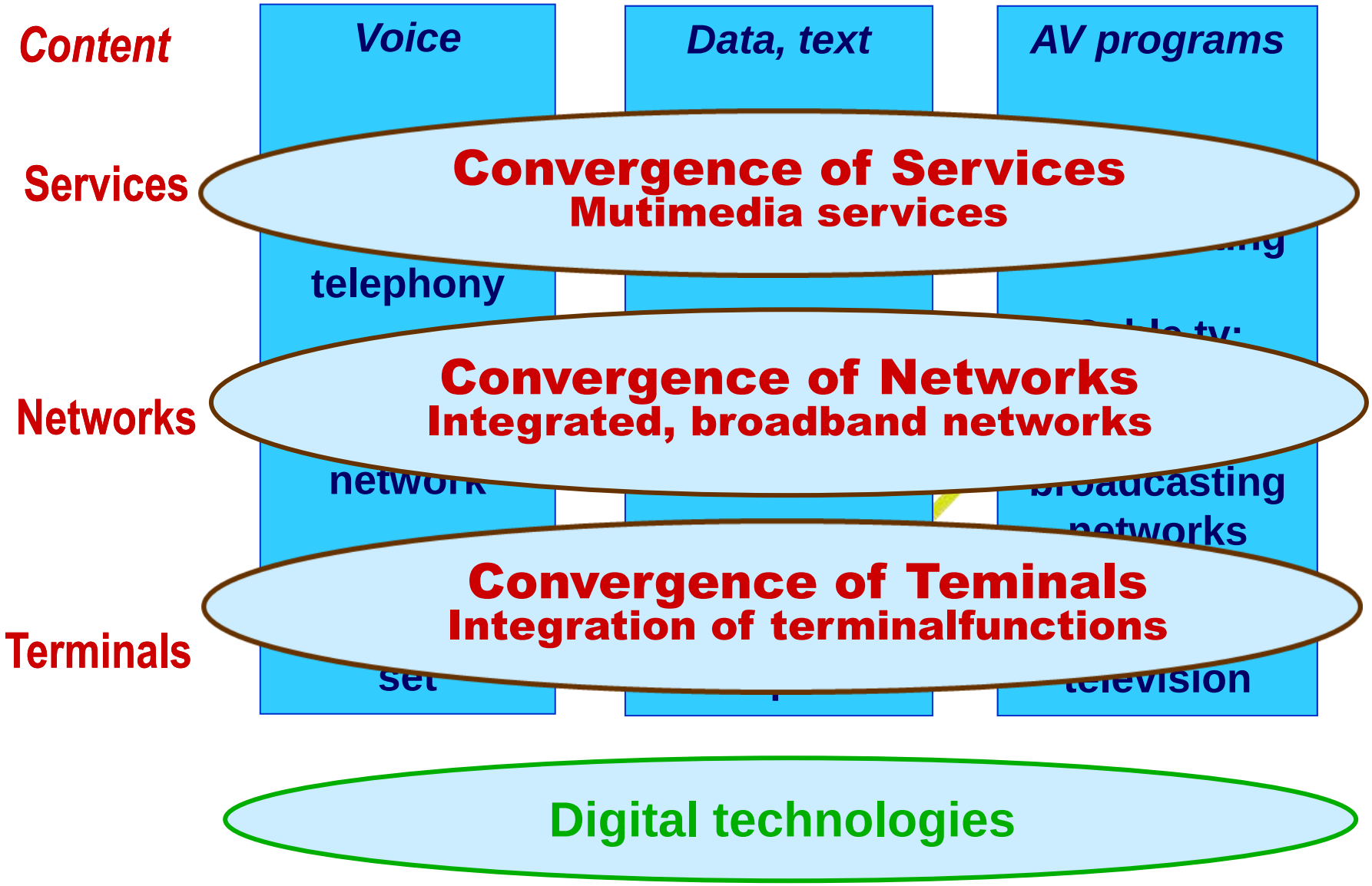
Traditional value chains: various contents – separated services, networks, terminals, markets and regulations



Convergence of Networks

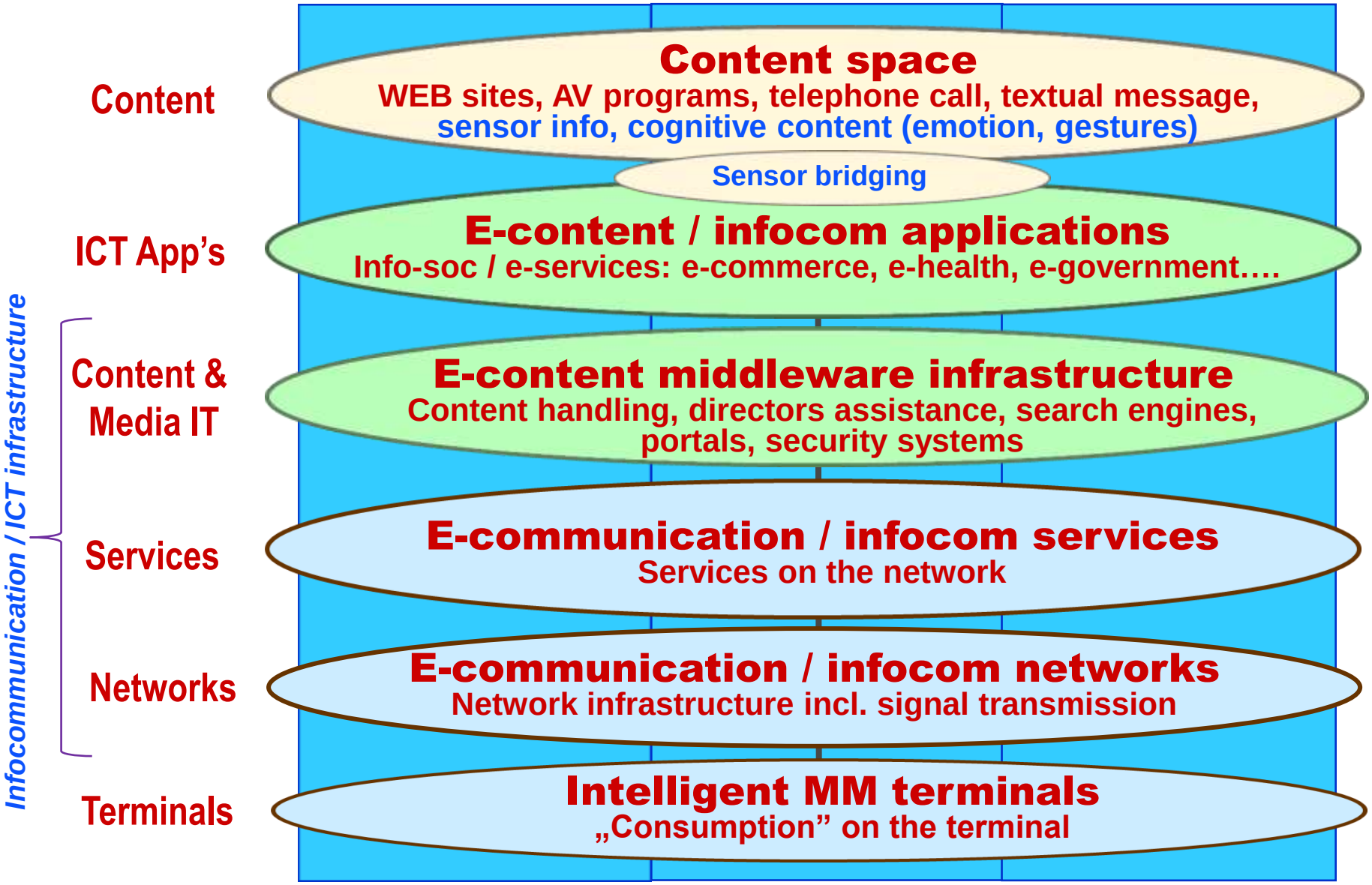


The intertwinning of traditional value chains results in various horizontal convergence forms and integrations

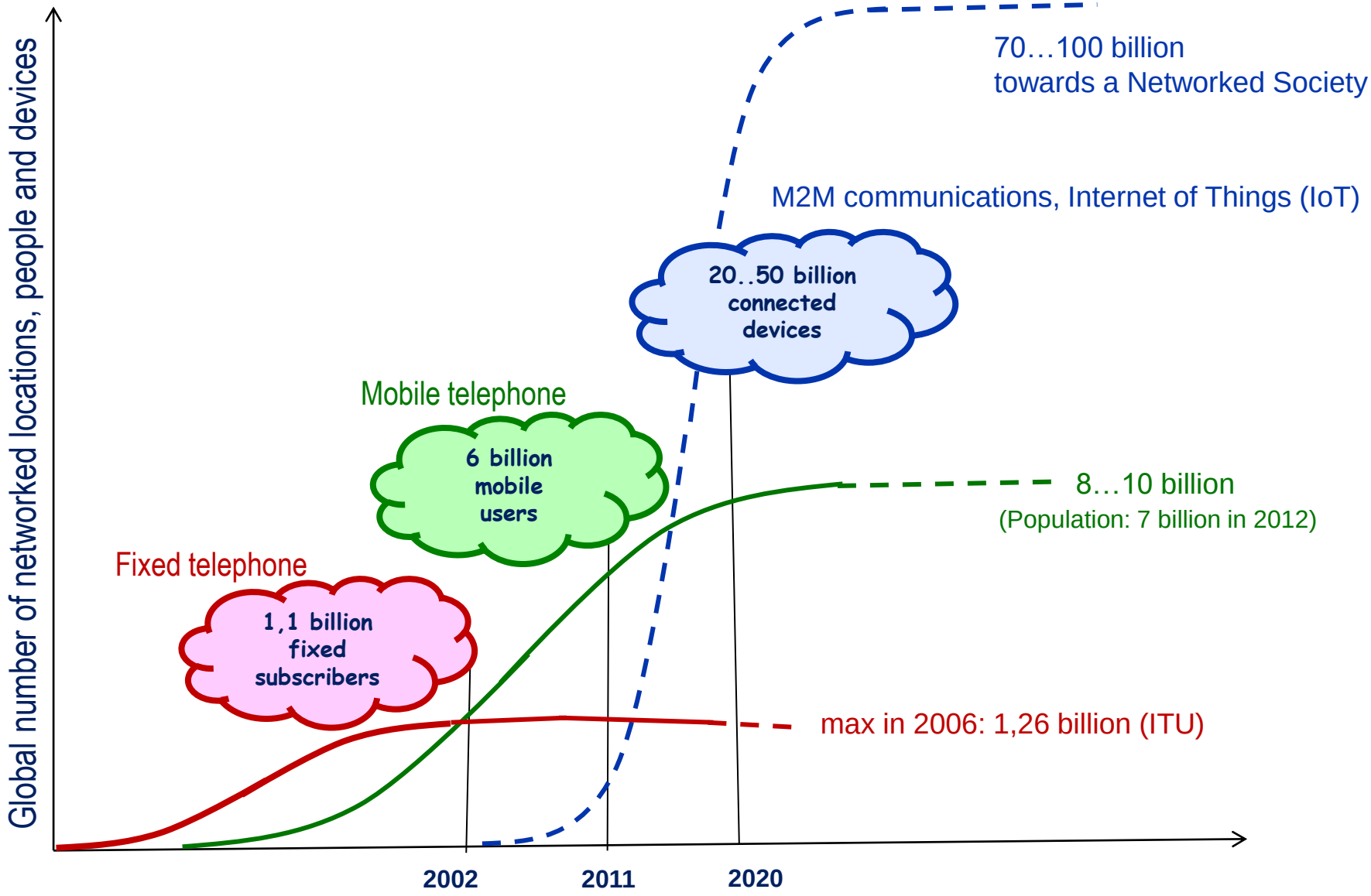


Integrated information (TIM) value chain

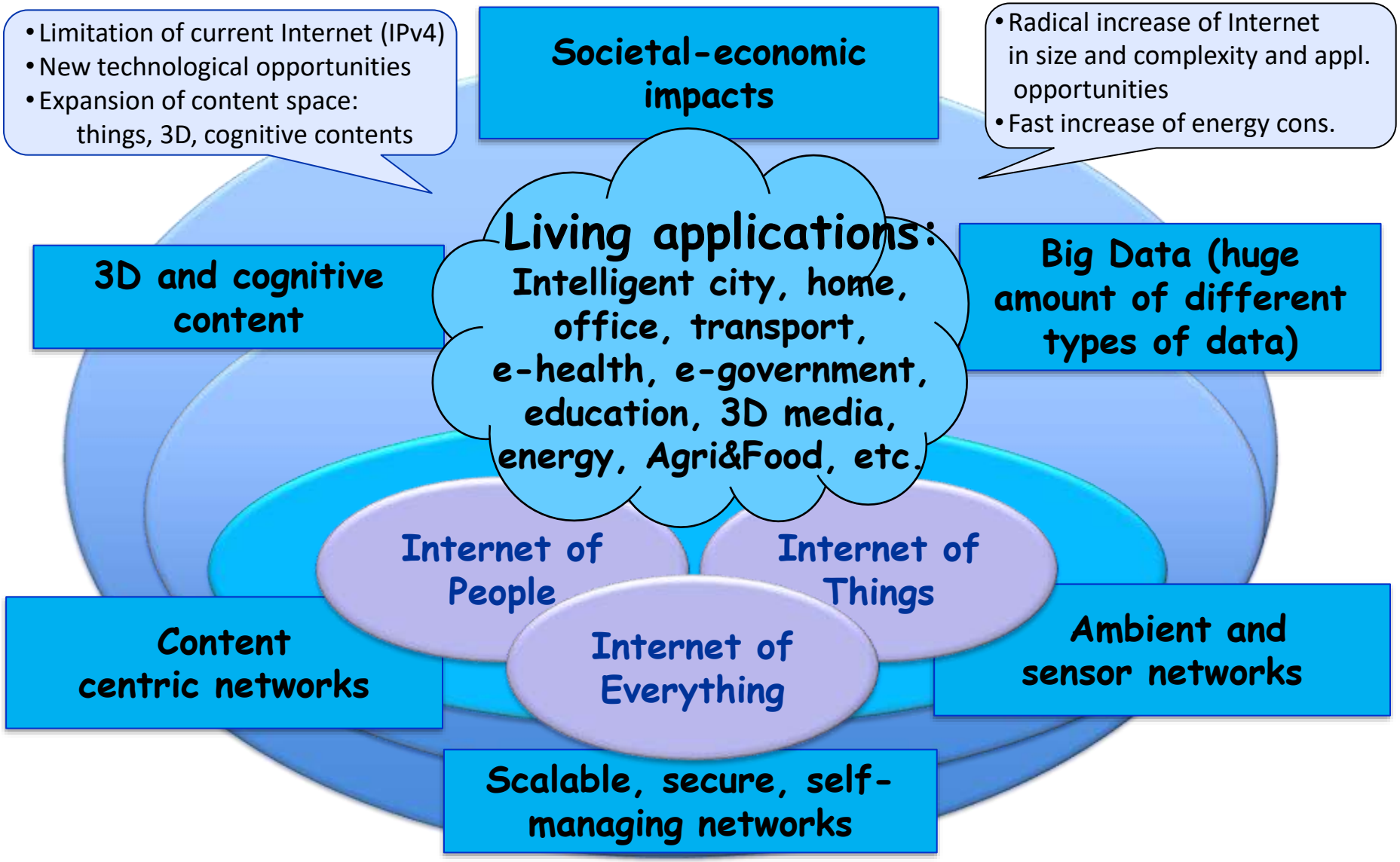
The layers of intelligent, digital infrastructure of information society



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 care, transport, education, knowledge systems, our every day life

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