

## DIGITALIZATION AND SMART MARKETS –IMPORTANT ELEMENTS OF COMPETITIVE AND INNOVATIVE STRATEGY OF REGION

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**Fast development of uniform digital market, activation of smart markets, represents one of the most important conditions and factors of competitiveness and innovativeness potential growth, both to the scale of the region and country. The paper presents the meaning of uniform digital market and smart markets as important challenges while developing and implementing regional strategy of innovation. It focuses on showing the features that should influence the growth of competitiveness of the region economy.**

**Key words:** smart market digitalization, innovation, strategy competition , region smart grids.

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## ЦИФРОВІ ТЕХНОЛОГІЇ ТА ІНТЕЛЕКТУАЛЬНІ РИНКИ – ВАЖЛИВІ ЕЛЕМЕНТИ КОНКУРЕНТНОЇ ТА ІННОВАЦІЙНОЇ СТРАТЕГІЇ РЕГІОНУ

**Швидкий розвиток уніфікованого цифрового ринку, активація цифрових технологій та інтелектуальних ринків відображає одне з найважливіших явищ та чинників конкурентного та інноваційного розвитку регіону та країни. Розкрито значення уніфікованого цифрового ринку та інтелектуальних ринків як важливих викликів у процесі розвитку та впровадження регіональної стратегії інновацій. Показано особливості, які повинні впливати на ріст конкурентоспроможності регіональної економіки.**

**Ключові слова:** інформатизація інтелектуальних ринків, інновації, стратегічна конкуренція, регіональні інтелектуальні мережі.

**Formulating scientific problem.** Widely comprehended information and communication technologies (ICT) play an important role in shaping and implementing policy of an economy based on knowledge. In particular, uniform digital market is an instrument that activates the development of knowledge. Fast development of uniform digital market represents one of the most important conditions and factors of competitiveness and innovativeness potential growth, both to the scale of the region and country. Uniform digital market allows to and complements the development of smart markets. Both, digitalization and smart markets represent currently two important challenges while building innovative and competitive strategy of a region. Research problem of the presented paper is the analysis of chances to use the Union policy within the scope of digital agenda that shapes the uniform digital market to develop and implement innovative strategy of a region. Moreover, research of relationships between the digitalization of economy (especially of regional economy) and creating smart market that influences both the growth of demand and supply parties within the area of transfer and application of innovation was an important part.

**Analysis of the last research and publications.** The analysis of the research status and used references in the presented issue concerning the meaning of digitalization and development of smart markets in the strategies of innovation are related to documents and works of appropriate EU commissions. Material of basic meaning is “Europe 2020 – EU Strategy for smart, sustainable and inclusive growth”[1]

document accepted by European Council on 17 June 2010. The EU strategy contains: three priority areas, five headline targets, ten integrated guidelines and seven flagship initiatives[1] One of the flagship initiatives of this strategy, realized at the level of EU, member states, regional and local authorities is the Digital Agenda for Europe perceived as attaining stable economy and social profits from the uniform digital market based on the access to broadband Internet. Detailed program of the initiative is included in the document "A Digital Agenda for Europe"[2]. Goals included in this work, areas of operations should be considered while developing programs and strategies of competitive and innovative economy in each EU state. This also applies to high extent to the level of regional strategies. The Digital Agenda is built upon wide consultations, in particular on inputs from the *Digital Competitiveness Report 2009, 2010*[3],[4] - CO ; the Commission's 2009 public consultation on future ICT priorities; the Conclusions of the TTE Council of December 2009, the Europe 2020 consultation and strategy; and the *ICT Industry Partnership Contribution to the Spanish Presidency Digital Europe Strategy*; the own-initiative report of the European Parliament on *2015.eu* and the Declaration agreed at the informal Ministerial meeting in Granada in April 2010[5].

**Goals of the paper:** 1. Presentation of the characteristics of selected elements of digitalization i.e. program of uniform digital market – these which significantly influence the building of competitive and innovative strategy of a region. 2. Determination of the nature and principle of creating smart markets treated as one of the challenges of regional innovation program related to digitalization program.

#### **Basic scientific material of the article.**

##### Digitalization – element of competitive and innovative economy

Informatisation is at the moment a leverage and a condition of development at the same time. And as the Internet in the context of today's requirements seems to be the obvious right of human, without propagation of informatisation, it is hard to imagine the development of innovation and intelligent markets [2]. The ICT sector directly drives 5% of the European GNP and its market value amounts over 660 milliard EUR per year. At the same time, its role results from that it contributes to the general growth of productivity where 20% is direct operation of ICT market and 30% investments into ICT [2]. This results from significant dynamics and innovativeness of the sector and its ability to influence the change of the methods of other sectors operations. Simultaneously, social meaning of ICT grew as well. The example of the way of life change is the fact that in Europe over 250 million people use the Internet everyday and almost all habitants of Europe use cell phones. In this situation, ICT is one of the conditions of sustainable development of EU, its individual countries and regions.

The European Program of ICT Development (digital agenda) is one of seven leading projects of Europe 2020 strategy. Its task is to specify the major role that information and telecommunications technologies (ICT) must play if Europe wants to attain its development ambitions in 2020.

The goal of the agenda is to determine to route that enable maximum utilization of economic and social potential of ICT, in particular the Internet, which represents an important mean of economic and social operations: it is used for work, enjoyment, communication and allows to freely express and exchange opinions. The success of the project shall contribute to the growth of innovativeness, growth of economy and improvement of everyday life of citizens and companies. Wider and more effective application of digital technologies shall enable Europe to test itself against major challenges placed in front of it. For inhabitants of individual countries, regions and communes, this would mean better quality of life thanks among other things to better health care, safer and more effective transportation, clean environment, new possibilities within the scope of media and easier access to public services (e.g. e-administration) and culture and scientific materials.

Development of fast networks currently observed is of similar revolutionary character as the development of power and transportation networks in the last century. Together with the development of electronics and automatics, borders between the digital devices vanish. The services undergo digitalization and transfer from the physical world to the digital domain; they are commonly available via a series of devices such as smartphones, tablets, PCs, digital radios or HD TV. It is anticipated that until 2020, digital

materials and applications shall be provided almost exclusively through the Internet. Significant potential of ICT could be used thanks to efficient deployment of the cycle of actions cooperating with each other. At the beginning, provide attractive materials and services in the intraoperational and borderless Internet environment. Vast capabilities of the Internet as to the content of different information and data as well as the increasing potential of services may have major meaning. Such action shall stimulate demand for higher speed and throughput of information and telecommunications devices and in turn this shall justify investments in faster, broadband networks. Propagations of this type of network shall open the door for innovative services that use faster connections. This process is almost self creating as depicted in the Fig. 3. Intensification of the presented course of operations may to a large extent increase itself by the influence of external environment conditions. It is mostly about the business surrounding that favours investments and entrepreneurship. Even though ICT is able to make significant changes, some important challenges must be overcome for this to happen. Though for many inhabitants of EU “digital life” based on worldwide limitless technology becomes reality, they cannot cope with the fact that common market, developed before the Internet remains very incomplete within the virtual sphere. There are still large differences as to the level of informatisation and digitalisation in individual countries and regions. Pleasure that citizens, consumers and employees draw from the application of digital technology, is disturbed by the concerns related to privacy and safety, insufficient access to the Internet, lack of proper information skills or absence of common availability of the network. It is obvious that citizens are not satisfied when application of ICT does not translate to better quality of public services. Because within this zone the application of ICT is the easiest to perceive. Too slow progress within the scope of informatisation as the Internet stimulates the world competition within the scope of investment, generating work places and economy influences, may cause that EU does not have sufficient potential and is not able to succeed within the developing sector of the Economy Based on Knowledge (Fig. 1).

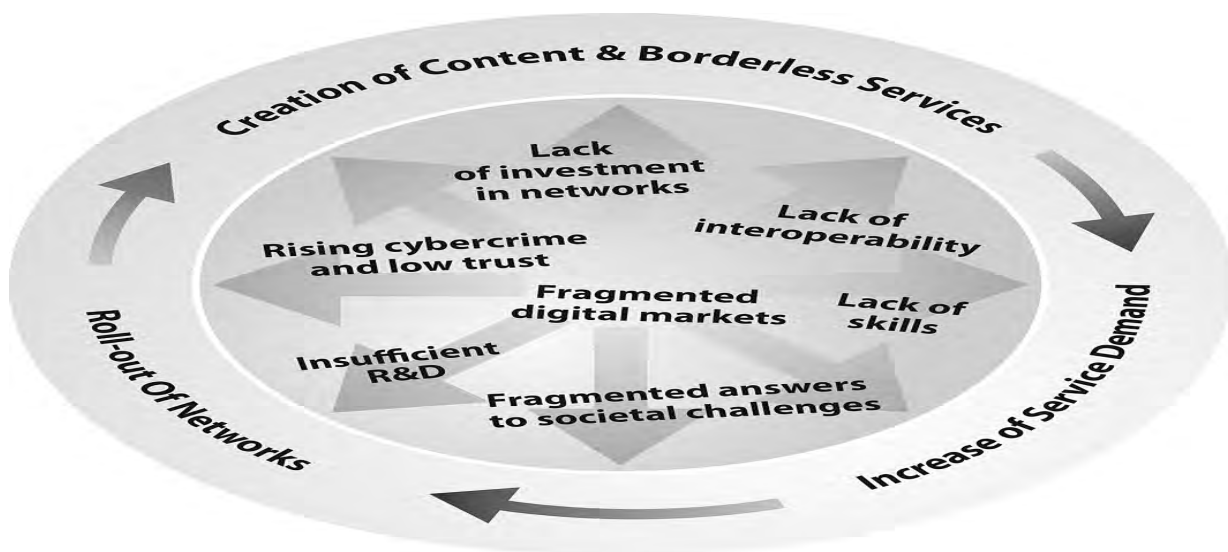


Figure 1. Self-creating process of digital economy

Source:[2] p.4

Research and development works related to this area of innovation represent very important barrier in the development of uniform digital market. In the EU, ICT related research and development works are still underinvested. Comparing to the key trade partner, USA, investment in ICT research and development programs in Europe represents 17% of all expenditures for research and development. In the USA, the level of investment is 29%. The total funds transferred to research and development into ICT in EU is significantly lower than in the USA. In 2007 in UE it amounted 37 billion EUR comparing to 88 billion EUR in USA, which is only 40% of the American expenditures on research and development within the area of ICT. These relationships are presented in the Fig. 2.

Considering that ICT represent major share in the total value added of the strongest branches of industry in the EU states, such as automotive industry (25%), household equipment (41%) and medical apparatuses (33%), lack of investment into ICT related research and development threatens to all European production industry and services sector.

Lack of investment within the area of ICT is related to three main problems:

- Low and scattered public funds into research and development, e.g. public sector in the EU spends less than 5.5 billion EUR per annum on research and development within the scope of ICT, significantly lower than competitive economies of the USA, Japan and China.

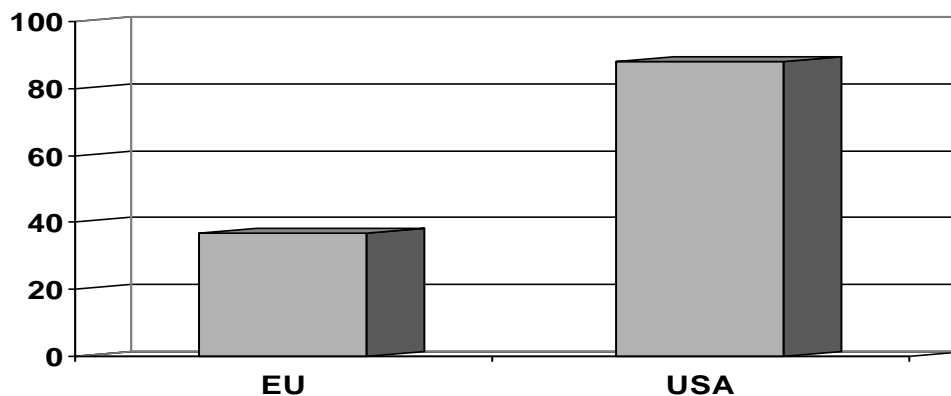


Figure 2: Total expenditures on ICT related research and development in billion EUR (2007)

Source: Eurostat and IPTS-JRC – for [2] p.22

- Fragmentation of the market and scattering of funds available for innovators are the factors that limit the growth and development of innovative ICT companies, especially small and average companies. This is particularly visible in relation to the regions and represents a barrier in realization of regional innovation strategy.

- Rate of implementing ICT based innovations, especially within public sector, is slow in Europe. Whereas the social challenges are the main lifeblood of innovation, within the scope of public procurement in Europe, innovations as well as research and development that could improve the quality and functioning of public utility services are used to small extent. Public services are one of predominating areas of local and regional policy. Transfer and application of innovation within this zone of services, to high extent depends of the performed economy policy in a region. Public services are an important carrier of innovation what is of particular meaning while overcoming mental barriers of local societies related to innovation implementation.

Creating smart market – challenge of regional innovation strategy

Problems of smart markets include two important areas. First is shaping of demand on behalf of a customer. Effectiveness of demand management is related to the necessity of rational utilization of limited resources (e.g. natural resources in the power engineering and transport) and realization of the sustained development economy principles. Some sort of a bonus for the customer for such market obsequiousness is stabilization or even lowering the bill for the bought product. It results from the acceptance of purchase (or consumption) of a given good in such amount and time, as the supplier proposes to the customer. If the end users are read to voluntarily adapt the demand, we can say about the demand party response (DR - Demand Response). Second important zone is the area of exchanging the value that takes place between customer and supplier. During this type of relations, new type of player at the market is shaped: receiver of value and at the same time supplier of value – expecting that the customer will influence the improvement of value of the product offered to him. At the current level of market development, effectiveness of demand management as well as exchange of the value depend to high extent on building proper distribution networks using ICT techniques to effectively optimize deliveries to the customer in real time and provide two-way communication with delivery systems. Active two-way communication between customer and

supplier attained by means of smart distribution networks could mean not only the information relationships but also material. Such type of relations shape new type of active customer, called prosumer. It is a person or organization with wide knowledge about the products and services related to to specified brand or sector. Frequently this knowledge is passed to others, including supplier. It is someone who has wider awareness while taking purchasing decisions and wants to participate in active creation of products. Created interaction between a supplier (company) and prosumer may be different, they may create new value in very differentiated way. The exchange of value can also take place, an example of which could be a prosumer that has at its disposal local energy source – being a consumer of energy and its producer at the same time. Aware and active consumer, and at the same time producer of energy will use, e.g. the potential included in modern industry of scattered energy devices – solar collector, micro-windmills, heat pumps, photovoltaic cells, micro-biogasworks or electric vehicles. Prosumer operations (prosumer as a recipient and at the same time producer of energy for own needs and to sell the surplus to the networks) related to effective management of resources to the scale of the region stimulates local entrepreneurship. Smart distribution networks that allow effective management of the demand, using these networks to create new values for prosumers, are accompanied by creation and development of other flexible interactive objects and systems using ICT. This is about objects and systems such as: smart buildings, smart transportation systems, healthcare information networks, digital technologies of controlling and supervising public services, environment protection, providing safety to inhabitants or complex of interactive systems and instruments for management of public services in the form of smart city. The observed subjective and objective development of interactive systems, objects and active market players allows to call this type of space the smart markets. Two of the elements of creating the space of smart markets important in the strategy of regional development are presented below.

#### Smart transport ( smart transport systems)

The system of public transport, next to safety, is one of the factors of evaluating and functioning of a city as a public space. Unpredictability of human behaviour together with other factors such as weather and atmospheric phenomena, days off or season peaks, make that traffic and transport infrastructure management is a difficult task. Smart transport systems is the way to improve the transport in the cities and an element of smart city.

Smart transport systems perceived as wide set of different technologies (telecommunication, information, automatic and measurement) as well as techniques and methods of management applied in the transport to protect life and health of traffic participants, increase the effectiveness of the transport system and protect natural resources.

The biggest benefits resulting from using Smart transport systems can be:

- Increase of functionality of all means of transportation (especially including public)
- Increase of traffic capacity by 2—25% [38]
- Improvement of safety on roads (reduction of accidents by 40-80%)
- Reduction of time spent on travelling and energy (by 45-70%) [38]
- Improvement of natural environment quality (reduction of combustion gases emission by 30-50%)
- Improvement of travelling comfort of travellers using public transport
- Improvement of pedestrian traffic
- Improvement of drivers traffic conditions
- Reduction of costs related to road fleet management
- Reduction of costs related to maintenance and renovation of pavement
- Improvement of public transport utilization
- Increase of effectiveness and productiveness of transport
- Increase of attractiveness of a region and city
- Increase of economical benefits in a region

Table 1 presents a division of smart transport systems

Division of Smart Transport Systems acc. to ISO TC 204

Category of service	No. of service	Name of service
<b>Traveller information</b>	1	Information before travel
	2	Information for drive during a travel
	3	Information during a travel with public transport
	4	Services related to personal information
	5	Guiding along the route and navigation
<b>Traffic management</b>	6	Transport planning support
	7	Traffic control
	8	Incidents management
	9	Demand management
	10	Enforcing the regulations observance
	11	Infrastructure maintenance management
<b>Vehicle</b>	12	Improvement of visibility
	13	Automated vehicle driving
	14	Avoiding collision with the vehicle before / behind
	15	Avoiding side collisions
	16	Application of advanced systems monitoring the condition of vehicle and driver
	17	Application of equipment limiting the movement of vehicle user during accident
<b>Commercial Vehicle</b>	18	Commercial vehicles with special authorization to traffic
	19	Administrative processes related to commercial vehicles
	20	Automatic inspection of vehicles on a road as regards safety
	21	Monitoring of commercial vehicles driving using onboard devices
	22	Commercial vehicles fleet management
<b>Public transport</b>	23	Public transport management
	24	Ordered haulage management
	25	Common vehicles management
<b>Emergency</b>	26	Notification about accident and personal safety
	27	Emergency vehicles management
	28	Hazardous materials and notification about incidents
<b>Electronic Payment</b>	29	Financial operations performed electronically
<b>Safety</b>	30	Public transport safety
	31	Increase of safety of weaker participants of the traffic
	32	Smart crossings

Source: [6] p.4.

The basic infrastructure of smart transport is its architecture. Creating the architecture is one of the most important problems to be solved while implementing smart transport. Such architecture is a set of relations of logic, physical and communication nature between the elements that form the smart transportation systems classified for example in table 1.

#### Smart grids(network)

New model of electrical energy distribution system, called smart grids, is strongly promoted in countries of Europe and America. This model is based on employing available ICT technologies to organize distribution network in order to supply energy providing the increase of supplies reliability[7]. This system is based on technical requirements of smart grids . The system gathers and analyses information scattered in the network, which is necessary to quickly locate the place and type of failure. Such operations improves the sullivan quality.

The increase of life quality level is obviously related to the increase of utilities supplies quality, including electrical energy. Such improvement within the scope of distribution is smart network that can be characterized by: flexibility, reliability and availability. Such network can also be characterized by improved effectiveness.

Smart grids can be specified as modernized power networks complemented by the system of two-way digital communication between a supplier and consumer as well as smart systems of metering and monitoring. Such solutions represent currently an important subject in the power industry trade in Poland and other EU states. Implementation of the system is a financial and technological challenge but in exchange it provides the following benefits:

- limitation of electrical energy prices increases for the end user because of implementing new competitive mechanisms at the electrical energy market, in particular disclosure of price flexibility of demand,
- limitation of energy consumption – adjustment of consumption to the needs and financial possibilities of a household The EU states experience show the potential within the scope of energy effectiveness increase at the level 6-10%
- The increase of customers satisfaction. This is related to the option of earlier detection of failures, its earlier removal and finally reduction of frequency of their occurrence. Knowledge about customers shall be improved. Their expectations can be understood and thus complementary services proposed.
- Increase of energy effectiveness. Implementation of smart metering systems will lead to less losses on energy in transmission and distribution networks, this means that in order to supply of the same amount of energy to consumer, less amount of initial energy will be needed, which is generated based on coal under Polish conditions.
- Increase of economical effectiveness. The same amount of energy could be supplied to receiver at lower costs, but at the same time could provide more incomes for a company due to implementation of modern methods of settlements with receiver, including tariffs.

Directives passed in the European Union and striving to reach the goals included in the energy and climatic package “3x20” are the additional incentive to implement Smart Metering in Poland.

**Conclusions.** Digitalization of innovative networks and uniform digital market increase the availability of IT systems for different economy entities and customers, create new possibilities of learning and at the same time improve the competitiveness of the IT technologies market providing high standards of data transmission and common availability.

1. Implementation of smart metering system and smart networks represents major financial and technological challenge but in turn it can provide the benefits not only to customers but also to regional and national economy.

2. Smart markets will represent more and more important element of economy based on knowledge simultaneously creating new business models of companies and attitudes of customers.

**Directions of research.** The most important directions of further research should focus on:

- evaluation of effectiveness of implemented new innovation instruments influencing the competitiveness of regional economy,
- mapping the risk of processes implementing the regional innovation strategy,
- creating prosumer groups and other players activating smart markets.

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