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## CONVERGENT DEVELOPMENT INFOCOMMUNICATION OPERATORS IN THE NATIONAL ECONOMY

## КОНВЕРГЕНТНИЙ РОЗВИТОК ОПЕРАТОРІВ ІНФОКОМУНІКАЦІЙ В НАЦІОНАЛЬНІЙ ЕКОНОМІЦІ

### SUMMARY

The article investigates the features of formation and development of the infocommunication in the national economy. Determined that ICTs encompass a set of information and communication facilities and methods of collection, processing and transfer of data to a new quality of information. The basic factors that influence the development of the information and communication technologies. Reasonable kinds convergence characteristic of the telecommunications sector and infocommunication in the national economy.

**Keywords:** convergence, infocommunication, information, national economy, markets, telecommunications.

### АНОТАЦІЯ

Стаття присвячена дослідженню особливостей становлення і розвитку ринку інфокомунікацій в національній економіці. Визначено, що інформаційно-комунікаційні технології охоплюють сукупність інформаційних та комунікаційних технічних засобів і методів збору, обробки й передачі даних для отримання інформації нової якості. Виділено основні фактори, що впливають на розвиток ринку інформаційно-комунікаційних технологій. Обґрунтовано види конвергенції, характерні для сфер телекомунікацій та інфокомунікацій в національній економіці.

**Ключові слова:** конвергенція, інфокомунікації, інформація, національна економіка, ринок, телекомунікації.

### АННОТАЦИЯ

Статья посвящена исследованию особенностей становления и развития рынка инфокоммуникаций в национальной экономике. Определено, что информационно-коммуникационные технологии охватывают совокупность информационно-коммуникационных технических средств и методов сбора, обработки и передачи данных для получения информации нового качества. Выделены основные факторы, влияющие на развитие рынка информационно-коммуникационных технологий. Обоснованы виды конвергенции, характерные для сфер телекоммуникаций и инфокоммуникаций в национальной экономике.

**Ключевые слова:** конвергенция, инфокоммуникации, информация, национальная экономика, рынок, телекоммуникации.

**Statement of the problem.** Convergence – the process of interpenetration once parallel evolving technology allows optimal access to all services. Results of convergence are promising devices, networks, technology, services with new features.

Telecommunications have a significant impact on the economic, social and cultural development of society. The volume of information transmitted in the world is permanently growing. The dynamics of the volume of transmitted informa-

tion over packet networks affects rapidly growing number of computing devices and doubling every 18 months, their productivity, increased competence of the population and its interest in the information.

**Analysis of recent research and publications.** In preparing the paper work has benefited both foreign and Ukrainian authors in related fields of science such as research problems of the sphere Infocommunication, research features institutionalization of the national economy. Among the authors whose works are devoted to this subject, known V.Vasylyev, M.Zhelezny, P.Akinin, N.Inkova, V.Koval, T.Kuzovkova, S.Marder, E. Petrova, L.Reyman, T.Sakalosh [1-11] and so on.

Moreover, all the authors, despite the diversity of approaches and opinions, express the idea that the scope Infocommunication rapidly institutionalized and becomes a powerful source of competitiveness of the national economy.

**Statement of the task.** The aim of the paper is to study convergence of operators Infocommunication in the national economy.

**The main material of research.** Communication networks are highly organized part of the infrastructure of society, which is composed entirely of network structures. With high reliability, stability, bandwidth, transmission speed, security, communication networks must ensure reliable high-quality transmission of information required at any time between any geographic points. In the course of its evolution, any technical system reaches a stage of the life cycle, when the reserves of its further development by the degree and quality of use of the achievements in the field of information technology.

The need for different types of information to make a real integration of different information networks at the household level. On a single channel data is transmitted very different nature. However, each type of information is characterized by specific requirements for transmission. When packet transmission of speech and video, it is important that the propagation delay in the

channel is minimal, and the routing and restoration of data flow packets are real-time. Allow the loss of individual packets. And when transferring text data or telemetry data is not important real-time mode, but no data loss is acceptable. Accounting for these features can lead to the creation of special technologies to the transmission of certain types of information [1; 3; 7].

For information and telecommunications systems and networks are characterized by not only high rates of change of generations hardware and building a network topology, but also convergence, ie the mutual penetration and fusion [2; 3; 5]. Convergence occurs both in depth (IT), and the width (network connection types, services). Network convergence reduces operating costs by switching to a single transport connection IP-platform. Convergence of integrated fixed and mobile (cell) forms of communication, providing subscribers with broadband wireless access to all types of communications and info-communication networks.

Currently, there is a process of «mobile substitution» – the subscriber base of fixed telephony reduced. FMC (Fixed Mobile Convergence) is one of the aspects of this process, a tool, a way of «soft» overflow services in mobile networks. Switches between FMC technology resource sharing fixed and mobile networks to provide the user a single continuous service regardless of its location, as well as for the organization of a single service and single billing for services. Convergence of networks (transport network) and access network is the most interesting stage merger of fixed and mobile platforms.

Just increasing convergence in the activities of the various sector, deepening Interdisciplinary processes and actualizing infocommunication component of the production of goods and services. Convergence of services provides the ability to deploy next-generation services. FMC is a basic service «single number» corresponding to all existing phone user and complements parallel or serial search callee control forwarding depending on the time and day of the week. One of the ways to increase market FMC services is creating both technical and legal ability to provide such services to the subscribers of one operator [4; 6; 7].

For corporate clients are very important advantages such FMC, as permanent staff availability, remote access to corporate resources, the possibility of combining geographically dispersed offices, intelligent call handling, economical replacement of institutional automated telephone exchanges. These benefits FMC can reduce the cost of intra-connection, and international long-distance calls. In particular, the international service «tel-evoting» will allow companies operating in several national market to use a single number to provide feedback to their audiences.

Convergence is today a merger into one telecommunications, data processing and imaging

technologies. This kind of convergence introduces a new multimedia era, when the provision of services to the subscriber's voice, data and image are combined during the session at random times from different sources. Telecommunications and media companies are integrators of all conceivable types of services, trying to satisfy all the needs and desires of the user. FMC is now a tool of competition between operators themselves, means «tying» of subscribers to a single «universal» operator.

Mobile telephony has evolved in a competitive environment. Therefore, one of the main problems of the mobile operators in terms of market saturation is a high level of churn to competitors [2; 8; 9]. The idea of «tying» of subscribers to mobile operator actually by creating mobile-fixed package of services using a common registration fields and the specific composition of services can be attractive for operators because of the change package (and operator) will be associated with the change of wired infrastructure. The key role of the operator in the future is a platform for development, support and delivery of services to end users. Moreover, the development will be carried out by independent players partners who are able to implement different business models in the open development environment.

Convergence of integrate information and telecommunications network based on packet switching and IP-protocol, making them suitable for digital communication systems in multi-channels and networks [3; 10; 11]. Convergence of services will provide users with a single package through various different terminals or network access. In addition, there was a significant breakthrough in the development of technical means to ensure subscribers different services, ie service delivery platforms SDP (Service Delivery Platform). The concept originated in the SDP environment of information technology specialists. It opens space for your own internal implementations. Often virtually equated concepts SDP and IMS (IP Multimedia Subsystem). The key to growth in the profitability of the operator business broadband (high-speed) Internet access services (Web-2.0) and various application platforms operators (IMS, SDP).

Functions, which are incorporated in the network equipment (telephone call to fixed networks, forwarding in networks GSM), and exclusive solutions to provide a specific set of specific services, led the transition to universal service delivery platform to potentially any set (Parlay, Web-2.0).

Web-2.0 technology allows customers by using network resources Internet, Web-browser as a client terminal and a plurality of Web-sites, to produce (generate) services, ie to become distributors of information and content. In Web-2.0 share many ideas with IMS/SDP, for example [2; 4; 8; 10]: the use of common service enablers; standard function blocks that build more complex services and applications. However, if the con-

cept of IMS has detailed principles of the core network, the Web-2.0 simply means that such a network has been built and operated. As the IMS, and the SDP, represent a radically new approach to the network architecture. To replace traditional vertical architecture comes horizontal networks converged architecture where functionality of the network expanded to general levels for all types of access (mobile or fixed) .

The first phase of convergence of communication networks characterize by the transition from IP-telephony to IP-based communications. The ongoing convergence of networks of three basic types: the public telephone network, mobile networks and IP-packet networks – has led to a variety of engineering problems in different planes (the evolution of multi-subscriber access networks; Softswitch scalability, low-capacity system functions provide operational investigative activities; intelligent services and IP-contact centers; operational management networks in transition). Thus, there is the fact that mixed networks – miscellaneous problems. This is not just a problem of a single multiservice Next Generation Networks NGN. Most of these problems previously solved in the public domain, there again, at a new stage infocomm spiral. In IP-based networks unified transport infrastructure can integrate all kinds of applications into a single service platform with a service package.

Convergence leads to the acquisition of the common signs and merging of communication and informatics in a new sector of the economy. The end product of information and communication services Infocomm are created on Infocomm networks using IT-technologies – receiving, processing, filling, distribution and transmission of information. Infocomm Development convergent evolution which results in the creation of converged networks (NGN, IMS), content-based and converged services, converged terminals (smartphone, wireless gateway, multi-terminal), promotes fusion operators, equipment manufacturers, service organizations in the provision of services and access to networks, revision of business plans and market strategy [9; 11]. Convergence in the IT industry blurs the boundaries, creating a market space integral sector. Convergence causes the transformation of conventional properties of telecommunications services and informatics in the new ones that affect the processes of their creation and implementation. In particular, there are new properties of ICT services.

It should be noted that the rapid development of modern wireless impossible without corresponding semiconductor components. Requires market devices for the network, which is the basis for science and industry in this area. Wireless network information based on a combination of two groups of technologies – wireless transmission of information and networking. Restrict mobility may sensitivity communication technologies to speed the subscriber, the complexity of the

transition from one service area in the contiguous without bond breaking, susceptibility to momentary connection.

Serve basis convergence network based on IP-protocol. Intelligent Converged Platform provides high-speed, secure access to business applications from a variety of devices. Technology which provides intelligent communications and solves existing problems in the implementation of multimedia services is the IMS. Currently, IMS defines the basic architecture for data services, voice and multimedia trafik. In IMS sets the general technology infrastructure that allows you to combine Internet, PSTN and wireless access networks. Converged networks built for converged services, as opposed to multi-service networks, do not focus on bandwidth savings. Development of converged networks directly depends on the maximum possible width of the channel provided by the application user.

Applications themselves can already save channels depending on user requirements to the quality of services that use different codecs, different bandwidth and hence a different voice quality. One example is the simultaneous application of converged service 3G video terminal and a personal computer through a content distribution network of the same service center. Thus, the convergence of applications allows you to create new packages and improve marketing [2; 6].

There are different scenarios for the evolution of mobile broadband networks broadband. Each operator chooses the path leading to the most effective radio network, based on IP-core with support for packet services voice and data. A key factor in achieving this goal is the selection of radio access technology that will most effectively support the new services. In particular, as a basic method in a radio access technology selected 4G systems of orthogonal frequency division multiplexing OFDM (Orthogonal Frequency Division Multiple). OFDM effectively cope with intersymbol interference and frequency-selective fading. Thus it is very effectively used frequency resources, despite the fact that the spectra of OFDM subcarriers overlap.

In fixed broadband technology advantages and disadvantages. For example, a dedicated fiber-optic link will always have a greater capacity than the shared radio resource, but the cost of construction of the «last mile» traffic termination and significantly higher than that to ensure coverage. The introduction of broadband radio access networks operators due primarily to population growth of demand for the services of multimedia resources to connect to data networks.

Possibilities of modern search engines, commercial services online stores, as well as a significant reduction in the cost of traditional communication services such as voice over IP technology makes modern telecom operators to study more deeply the organization of radio segments. An important feature of the use of radio access sys-

tems at the present stage of development is the transition from solving problems of the organization to the remote subscriber channels to address the challenge of maximizing the density of subscribers and increase the integrated network bandwidth. Obviously, to solve this problem it is necessary to increase the number of base stations in its service area, which will inevitably lead to the appearance of interference, and hence electromagnetic compatibility issues in this case, come to the fore.

The rapid development of communication industry creates a new reality in the form infocommunication single environment All-IP, all-inclusive broadband, ultra-high speed highways and final separation from service infrastructure. Modern existing heterogeneous network structure will be transformed into a more elegant and simple form based on All-IP. All-IP approach implies that the four basic services (fixed voice, mobile voice, fixed data, mobile data) will be provided on the basis of a single network infrastructure. Core Network SAE (System Architecture Evolution) plane becomes maximum IP- network.

Technology LTE (Long Term Evolution) is the next stage in the development of mobile networks GSM / EDGE (Global System for Mobile Telecommunications / Enhanced Data for GSM Evolution) and WCDMA / HSPA (Wideband Code Division Multiple Access / High-Speed Packet Access). It can significantly increase the network capacity and data transfer speed, which allows operators to bring to market innovative services that require more speed and performance.

Purpose and essence of the concept of LTE / SAE (System Architecture Evolution) is effective support for widespread commercial application of any services based on IP. Architecture LTE / SAE is optimized in the (functional level) client. All interfaces implemented protocols based on IP. Integration of access technologies, which do not relate to the 3GPP (Third Generation Partnership Project), carried out on the basis of IP as the client and the network.

Architecture involves a move to a smaller number of nodes, which is reduced from four to two. Separation of functions performed interface radio access network RAN-CN (Radio Access Network-Core Network), similar to WCDMA / HSPA. Also separate the control plane and the plane between the client system, the mobility management MME (Mobility Management Entity) and the gateway. Thus, within one or more access technologies is provided by the presence of stable point for all users (clients) on the basis of IP, regardless of the mobility.

LTE – the technology of mobile communication systems in the long term. Compared with WCDMA-technology it is a new technology and based on the method of access OFDM, which due to its flexibility optimizes the use of the spectrum. Reference (base) part of the network architecture LTE / SAE connection simplifies access

networks and eliminates the switching elements of the channel, because it is completely based on IP. System LTE / SAE will provide unprecedented levels of performance for both new and already applied for the frequency bands in the networks of 3GPP and 3GPP2 [1; 3; 4; 8; 10].

The main problem of all new radio is receiving radio. Today, the problems with radio frequencies are available for professional digital radio, digital television, broadband, digital broadcasting, the entire next generation mobile communication. Virtually any personal device having computing power, sufficient for text and graphic information from the server to the handheld computer is equipped with one or another network interface from the modem to the WiMAX (Worldwide Interoperability for Microwave Access), a specification of equipment for wireless access to the city public networks .

Today, in some countries, for example in the USA, are being developed towards a promising mobile network using satellite segment. This network «5G» will be a unified global secure broadband data network. On the basis of this decision, the following services: secure wireless data service WDS (Wireless Data Services); global virtual private network VPN (Virtual Private Network); opportunity to conduct financial transactions with mobile phones; Mobile Cloud Computing, combining the concept of providing software as a service and remote storage of data and principles of renting (Application Service Providers, APS).

Network «5G» may consist of the following components: technological developments such as the «universal translator»; translate network based on grouping LEO nano-satellites developed by NASA. System «5G» will combine voice, video, data and IP-based Wi-Fi, as well as intelligence Machine-to-machine.

During the existence of the mobile market the number of mobile subscribers in three times the number of subscribers to fixed-line networks. Need for data rates increases many times and free radio resources are less and less, despite advances in signal processing. In particular, the use of MIMO technology provides for the introduction of additional antenna reception and transmission channels and has two goals: improving the reliability of reception and transmission and ensure communication of spatially separated channels SDM (Spatial Division Multiplexing).

Adaptive Antenna Systems AAS, using MIMO technology for wireless transmission and reception lines form a multi-channel system, increasing the signal / noise ratio, significantly improving the quality of the radio signal and thus affect the QoS (Quality of Service) for the client.

**Conclusions and prospects for further scientific developments in this direction.** Today the popularity of technology converged FMC networks in the world is steadily increasing. Want a cheap mobile, local and long-distance communication, and along with fast internet, it is becoming more

and more. Operators offer integration of existing infrastructure with high-speed packet data networks, but at the level of access (Wi-Fi, WiMAX, 3G, 4G) services form, focusing on the use of the latest platforms with advanced features, which primarily include communicators and smartphones.

The widespread use of information and communication technologies makes it possible not only to optimize the performance of technical and socio-economic systems, that is to significantly improve their efficiency, but also to minimize the risks to develop universal management approaches. Are promising networks built using radio technology, allowing maximum mobility and acquire independence. In them there is a vast potential and they continue to develop.

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