Critical communication capacity

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Abstract

The need for the communication capacity (postal and telecommunications) increases daily during major incidents (pandemics and wars). The main aim of the paper is seeking an answer to the question "Was the structural and functional separation of telecommunications and the postal service necessary in the 20th century" The main elements of the network and service mergers in the future are also discussed in the paper.

***Keywords**: Postal, Telecommunications, Services, Pandemic*

1 Introduction

The need for communication grows worldwide in the times of major economic, health and security crises.

Social networks are booming, government services are being digitalized, distance learning is taking place, e-commerce is reaching unimaginable proportions, and postal and telecommunication services are using the maximum capacity of the existing infrastructure. What demand will be for communication capacities is beyond imagination.

The picture of the world has definitely changed. Independent communication networks are not enough, but the synergy of different communication infrastructures, networks and channels that will meet user needs for electronic and physical communication has to be considered.

This new communication chain will be as strong as the weakest link in it, and all the participants in it will have to contribute to an increase in the communication ability through the growth of the capacity of the existing and a new infrastructure. For example, the operators of public electronic communication networks have the right to request that another operator's or third party's electronic communication infrastructure should be shared when it is necessary for a competitive, economical and efficient performance of electronic communication activities, and universal postal service operators (UPS) are obliged to provide the access public postal network (PPN) to other operators on the market in order to perform the UPS.

The pandemic has taught us that user demands have changed. Many users have begun to use electronic communications so as to provide services in the trade, distribution, health or education sector. E-commerce has flourished even in rural areas.

In the world today, a small number of telecommunication and postal companies provide universal services, and almost all of them have the last-mile problem. Postal companies are reducing the number of their PPN units and the number of the UPS employees looking for new ways of delivery (delivery in the post office instead of a last-mile delivery) and telecommunication companies are using interoperability in order to solve the unprofitable last-mile problem.

Universal services are not expected to be profitable, and the approach used in many countries significantly reduces the communication capacity needed in the times of a crisis, war, and long emergencies.

The very process of the structural and organizational separation of the Post and Telecommunications has significantly reduced the strength of both communication systems in situations of emergency.

After the XX Washington UPU Congress in 1989, both sectors set out to meet user needs for

new sophisticated services in search of a profit and the liberalization of services and networks.

Although there is a satisfactory offer of postal, courier and electronic communication services in urban areas today, there have yet been gaps between supply and demand in the conditions of the Covid 19, the so-called "lockdown" pandemic. All this has been even more pronounced in rural areas.

The research study shows that there is the need for the convergence of postal and telecommunication networks and services in the field of universal postal and telecommunication services [1].

2 The Critical Communication Capacity and the PT Network

The aspects of the convergence of the postal and telecommunication networks can be described according to [1] in (Table 1).

Table 1. The aspects of the converging physical and electronic messaging services [1]

	Post	**Telecommunications**	**Trend towards convergence**
Consumer need	Reliable written communication over long distances	Written communication over long distances	Yes, consumer ask for fast and reliable access to messages
Product / Technology	Letter mail and parcels	DSL, wireless	Yes, substitution by electronic messaging
Frequency of service	One per day (5 to 6 days per week)	Continuous	Driver for convergence-
Speed	Low Trend: lower (fewer deliveries per week)	High Trend: differentiated (net non-neutrality)	Driver for convergence
Coverage	Nationwide	Nationwide	-
Reliability	Reliable	Less reliable	Yes, by digital IDs provided by postal operators
Confidentiality, integrity	High	Rather low	Yes, people trust in brands of postal operators
Price	High Trend: higher	Low Trend: lower	Driver for convergence
Accessibility	Postal retail outlets or post box criteria based on distance	All residences and business offices on request	Driver for convergence
Scenario for USO reform	Reform in delivery models and frequency	Electronic convergence (fix and mobile infrastructure) or technology neutrality Increased minimum speed	Yes, by hybrid services

2.1 The public postal network (PPN)

Designated (national or public) postal operators have long borne the burden of the universal service obligation (USO), according to which they are obliged to deliver at a uniform price to every home and business in the country although the costs of such delivery to remote areas may often be much greater than the uniform price itself. This burden has become heavier over the past thirty years, and for the three reasons. Firstly, the privatization revolution of the 1980s confronted the incumbents with competition from new players not burdened with the USO. These entrants often had a lower cost base and were able to fix lower prices, thereby eroding the margins having formerly been achieved by incumbents in a more profitable urban market. Still subject to the USO, many incumbents saw margins fall below the cost of capital and many went into a loss. Secondly, the internet revolution (dating from the early 1990s) has transformed the economics of postal services around the world. It has reduced demand for letter mail because emails are a cheaper and quicker means of communication, thereby reducing revenue. On the other hand, it has boosted demand for parcel items as online shopping has taken a growing share of the retail market, all to the detriment of the high street and the shopping mall. An industry struggling to adapt to these seismic changes was further hit by the Great Recession in 2007, the recession being the worst in the postwar era. Some countries recorded a 4% decline in the real output at the low point of the crisis and the subsequent recovery was anemic due to past standards, leaving the economic activity subdued for a decade or even more. The impact on postal volumes which track the GDP growth very closely was huge. The Great Recession ushered in a new era of falling letter volumes. These three factors – the internet revolution, the privatization revolution and the Great Recession – have affected incumbent postal operators everywhere. The threat scale broadly differs from one country to another, depending on the regulatory environment in the jurisdiction and the intensity of the competition from new entrants, how badly their economy/economies was/were affected by the Great Recession and how rapidly they responded to falling demand for letters by switching to the fast-growing parcel market [2].

These problems were solved in several ways, namely by:

- putting up the UPS prices,
- reducing the delivery frequency, and
- reducing the minimum number of postal units.

These variations are not readily explained by the obvious factors such as the size of the land mass served, the population density or the number of the letters or parcels delivered per capita [3].

2.2 Public telecommunication network (PTN)

The telecommunications sector originated from the postal sector. Historically, the first communication systems were actually postal systems. With the development of technology, an accelerated data transfer, the telecommunications sector has developed within the postal sector. The liberalization and privatization of public operators have led to a loss of the synergies between these two sectors. At the same time, a universal service was much needed in both sectors. However, both universal services most frequently developed independently, slowly and with great difficulty in the last mile.

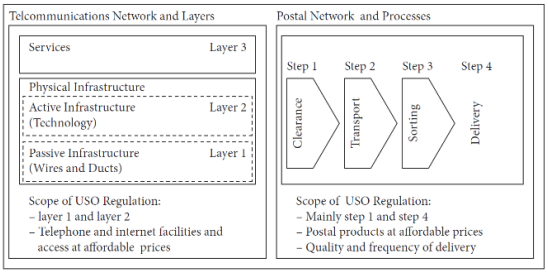

Fig. 1. Approaches to the network analysis: the telecommunication infrastructure vs. the postal value chain [1]

The biggest losers of the unbundling were those in rural areas, where privatized operators did not see a chance to make a profit. The state simultaneously took care of the amount of the costs and investments in the network.

The quality of the service was controversial in rural areas. Postal operators addressed this issue with the "exceptions to the five-day last-mile delivery" and telecommunication operators used interoperability as an option to make fixed-line replacements with mobile communications.

The public fixed telecommunication network is a telecommunication network which, is used in whole or in part to provide various public telecommunication services between the fixed terminal points of the network, including the access infrastructure, as well as the infrastructure for connecting public telecommunication networks inside a certain territory and outside it.

The public mobile telecommunication network is a telecommunication network which is implemented in whole or in part through the public mobile telecommunication network on certain radio frequencies [3].

2.3 The public postal and telecommunication network (PPTN)

Similarly to the rest of the global economy, the postal and telecommunication sectors are being faced with unprecedented change as the decades-long trends of liberalization and digitalization are continuing to transform the world or these two sectors. The United Nations system works towards the achievement of the 2030 Agenda and its Sustainable Development Goals (SDGs). Governments should decrease gaps in postal and telecommunication development through increased investments and focused policies and promote various ways to utilize networks for socioeconomic development. Regulators should harmonize and enhance the sector's regulatory framework. Operators should seek to enhance their performance by implementing diversified strategies and operational improvements. Ultimately, other stakeholders from the private sector and public institutions should pursue integration into the sector by engaging themselves with traditional stakeholders and *vice versa* [2,3].

In order to achieve the goals, it is necessary that services should be digitized, and the necessary infrastructure provided with the optimal communication capacities. In addition to telecommunication companies on the market, such as service and network operators, there may also be postal, courier and logistics companies developing their solutions by offering different types of services or the infrastructure. For example, the Post of Serbia has developed its own PTT net solution (now owned by Telekom Serbia). Today, the Post of Serbia has a very well-developed computer network reaching out to the rural area (1,500 locations). Such networks with interoperability with other networks providing different services may contribute to an increase in the communication capacity.

2.3.1 Synergy factors in PPTN

Today, technological connectivity – electronic communications are based on the use of a number of connected, technologically diverse networks. As a precondition for the system to work well in this area, technological neutrality is stated, which is justified from the point of view of achieving the maximum utilization of available resources, i.e. as a good platform for the further development of the infrastructure and research in the field of electronic communications. It should be borne in mind that periods have been changing throughout the history of telecommunications in which some of the existing technologies have fallen into oblivion, having been replaced by new ones. Later, thanks to new achievements in science and the technology of production of certain assemblies, cables or just signal transmission and processing techniques, the conditions have been created to return to the previous, now significantly improved directions of telecommunications development. Thus, in the last fifty years of telecommunication development, the periods of the domination of various system solutions have changed. Given the decline in the prices of optical telecommunication systems, as well as their strategic importance to the development of electronic communications networks, electronic services and information society as a whole, the predictions that the FTTH will be the most common Internet access in the next decade have had their justification, as shown in Figure 2. As the basic access to the Internet, the ADSL has completely been abandoned in developed countries. Copper cables are either being replaced by optical fibers, or a new infrastructure is being installed, which explains the trend of this technology's intense decline. Mobile telecommunications are also showing a declining trend, given the fact that the market has been saturated. What can be a great incentive for their further development is a possibility of introducing broadband access within the scope released on the basis of the digital dividend. The EU sees this as its way out of the economic crisis.

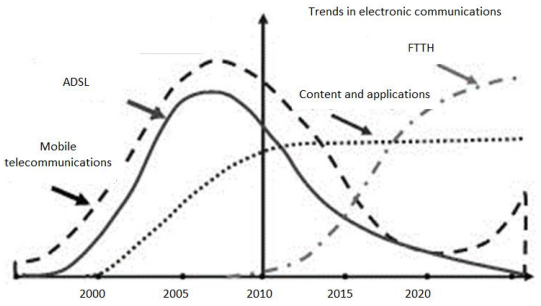

Fig. 2. The trends in the development of electronic telecommunications [4]

It is in this that a great opportunity for the synergy of the postal and telecommunications infrastructures is perceived in forthcoming years.

Availability – the postal and telecommunication networks are compatible. In rural areas, there was a telecommunication hub in each post office, which may continue to be crucial for access to optical networks. The services that the post office can offer are numerous. Availability is one of the features of the universal service, and post offices in rural areas are located at a maximum distance of 3-6 km from the last user. This potential cannot be provided by any network other than the public postal network. The existence of two networks creates big difficulties, especially so for the state itself, which must provide universal services. That is why the existence of a single universal PT service network is one of the solutions.

More services – The development of a public PT network would be the basis for the introduction of more services in the rural area. The network access could be enabled at affordable prices without discrimination (either universal or other services) with respect to operators and users.

A better quality – Prior public networks were built so as to satisfy universal services in both the price and the quality. The volume of the universal service was falling, and the network was a big burden. The consequences were the incurred losses and the operator's requirements to reduce the universal service obligation (USO). Not to mention the problems in applying the methodology for tracking costs and compensating USO losses.

The proposed PT network solution would be considered as a critical communication and state resource ready to respond to all challenges while simultaneously earning through the acceptance of all the existing services, affordable UPS prices and other commercial services under the access contract.

Of course, it is very difficult to form such a PT network under today's circumstances, in which the universal service providers have already heavily invested in their infrastructure. Most operators have been privatized in the EU.

In today's conditions, the PT network could be defined in those areas that represent a loss for the PT universal service operators. In this way, the state would avoid the obligation to compensate for losses incurred in universal services and would be given the opportunity to increase profitability by opening a PT network in unprofitable ventures for all PT services.

The critical communication capacity that may be achieved through the synergy of the postal and telecommunication networks and services is not just a simple sum. Synergies in rural areas would greatly reduce the network maintenance costs, and they would increase its availability and quality. In these areas, these networks are now working in parallel, with the engagement of twice as many human and material resources. In addition to cost reduction, the development of a single universal PT network in non-profit areas would ensure that revenues are sufficient to provide the universal service without any reduction with high-quality services.

2.3.2 The critical capacity PPTN design

Networks in rural areas are useful for increasing critical communication capacities in multiple ways. In addition to expanding the existing infrastructure and increasing the availability of all PT services, they create an opportunity for users in rural areas to raise the IT education level. An opportunity is being created for the development of rural regions not at the expense of any PT company, but exclusively as a result of a clear state policy on development.

Determining the area to be covered by the common state-owned PT network is very complex and requires a general analysis and answers to the questions where we are now, where we want to be, and how we will achieve it. The strategic management of the PT network planning is very sophisticated. Figure 3 briefly describes the area selection procedure and the implementation of the PT universal network.

3 Conclusion

The privatization and liberalization models in the postal and telecommunications sectors have not led to satisfactory results in all countries. Even in the European most developed countries there are the UPS postal operators that are making losses in the USO, while simultaneously the influence of private postal, courier and logistics companies has been spreading on the liberalized market in the most profitable segments. The latter do not have the USO and only provide the services that generate a profit for them.

In the telecommunications sector, the situation is a little different, because fixed and mobile telephony appears as a public service, i.e. services are established in rural areas through interoperability. The network maintenance and fieldwork are the problem with these operations, which provokes additional problems as well.

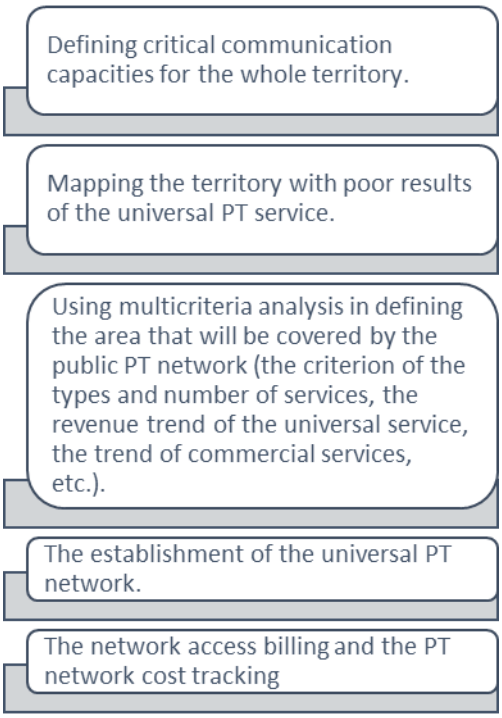

Fig. 3. The PT universal network establishment methodology

It is precisely for the reason of this fact that the synergetic effects of the public PT network establishment in peripheral rural areas would contribute to reduced costs in both areas. PT technical staff may simultaneously provide services in both these sectors and provide the necessary training to the population in order to make a greater use of IT.

The revenue generated from access to the PN network would be used for the development of the PT network and the services.

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