International Journal of Advanced Research in IT and Engineering

ISSN: 2278-6244
Impact Factor: 6.690

POSTAL SERVICES IN THE CONDITIONS OF FOURTH INDUSTRIAL REVOLUTION

Anna Otsetova, Assist. Prof., PhD, University of Telecommunications and Post, Sofia, Bulgaria

Ekaterina Dudin, Assist. Prof., PhD, University of Telecommunications and Post, Sofia, Bulgaria

Abstract: *Postal services play a fundamental role in each nation, because of the double impact they generate from a social and economic point of view. Postal services are changing daily in the conditions of Fourth Industrial Revolution. The Fourth Industrial Revolution is a new era in the economic development because of the explosiveness of the technologies development. In this era technology is no longer an enabler, but a business driver. The growth of the internet, mobiles and communication technology has added a different dimension to postal market. The main focus of this article is to discuss the impact of the Fourth Industrial Revolution on postal services. New digital technologies is having a strong influence on the way postal operators are functioning and providing services and will continue to have greater impact in the future. The extend to witch different postal operators are using digital means vary widely and their potential is still far from fully exploited.*

Keywords: *Postal Services, Postal Sector, Fourth Industrial Revolution, Information and Communication Technology*

INTRODUCTION

The Fourth Industrial Revolution is the developing environment in which technologies such as the Internet of Things (IoT), robotics, virtual reality and artificial intelligence are changing fundamentally the way people live, do business and related one to other. The Fourth Industrial Revolution is a new era in the economic development because of the explosiveness of the technologies development. The distinctive features of the Fourth Industrial Revolution are the speed of technological breakthroughs, the pervasiveness of scope and the tremendous impact of new systems (Sung Hyun Park, Wan Seon Shin, Young Hyun Park & Youngjo Lee, 2017).

The First Industrial Revolution used water and steam power to mechanize production. The Second Industrial Revolution used electric power to create mass production. The Third Industrial Revolution used electronics and information technologies to automate production. Now, a Fourth Industrial Revolution is characterized by a fusion of technologies

that is blurring the lines between the physical, digital, and biological spheres (Schwab, 2015).

Postal services are widely recognized as playing an important role within society. The postal services are a vital component of countries economic and communications infrastructure and they are an essential instrument for communication and trade.

Over the last few years increasing attention has been given by both researchers and practitioners as to how technologies can have an impact on postal services development. Technology is no longer an enabler, but a business driver. The growth of the internet, mobiles and communication technology has added a different dimension to postal market (Ankrah, 2015).

Hence, this article is focused on the impact of the Fourth Industrial Revolution on postal services.

ROLE AND CHARACTERISTICS OF POSTAL SERVICES

Postal services play a fundamental role in each nation, because of the double impact they generate from a social and economic point of view. Postal services are changing daily. During the last decades a number of important postal market developments have taken place. Now, postal industry lies at the crossroads of four markets important for economic development: communications, advertising, transportation (including logistics) and financial services markets (*Fig. 1*). The vitality and economic role of the postal sector in the future must develop in harmony with these closely related markets.

In a rapidly changing world, the role that postal services play in ensuring the right to communication through the exchange of messages, the transport of parcels or the sending of money is now more relevant than ever. Postal services are vital to e-commerce development, ensuring the delivery of millions of parcels daily. Postal services play an essential role in the development of trade, especially for small and medium enterprises. In addition, over 1.5 billion people around the world have access to financial services via the post office (Universal Postal Union, 2017).

Postal sector is an essential infrastructure that facilitates the functioning of the global economy. The sector has the largest integrated distribution network in the world and can physically connect everyone around the world. On the other hand postal electronic network enables postal operators to play a key role in e-commerce. Finally, the postal sector is the second largest contributor to financial inclusion.

ISSN: 2278-6244
Impact Factor: 6.690

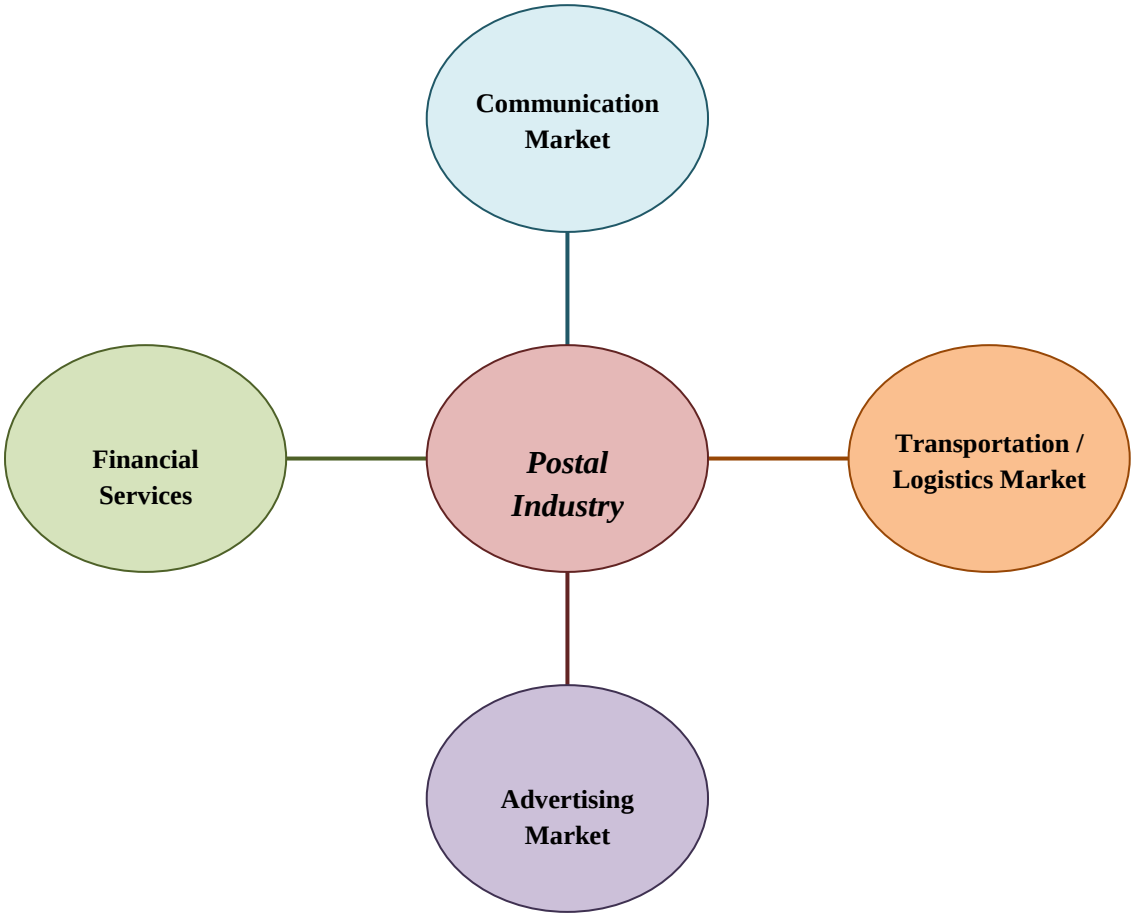

Fig. 1. The strategic position of postal services market

Around the world about 1.5 billion people send money, pay their bills or receive social payments via postal operators (Clotteau & Measho, 2016). The provision of basic postal financial services contributes significantly to global economic and social development and plays an important role in improving living standards. The postal sector is able to play a key role in the payments market and the financial inclusion of populations, diminishing consumer risk related to the usage of informal networks and money laundering (Universal Postal Union, 2017).

Figure 2 presents the main characteristics of the postal infrastructure.

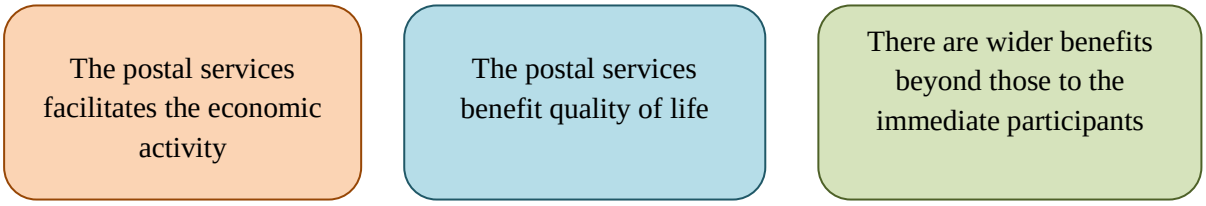

Fig. 2. Characteristics of postal infrastructure

In many countries the postal network is the largest network in the rural areas and it ensures the provision of financial, communication, logistics and other retail and government services.

At the same time postal industry is one of the largest employers in many countries.

The main characteristics of postal services can be summarized as follows:

- Postal services are services that involve collection, transportation, and delivery of all types of letters, documents, printed matter (books, newspapers and periodicals), and parcels by all types of public and private operators.
- Postal services are services of general economic interest (more specifically Universal postal service (UPS)).
- Postal services are an essential instrument for communication and information exchange.
- Postal services promote social, economic and territorial cohesion.
- UPS is a set of postal services, which is provided regularly (during all working days, at least 5 days a week) within fixed working time, with definite quantity and at affordable prices, and is accessible for every user at the territory of the country regardless of his place of residence.
- Time element has great significance in postal services marketing.
- Postal services are built around four core activities – collection, transport, sorting and delivery. These activities are traditionally labour intensive.
- Contemporary understanding of postal services (especially courier services) defines them as a type of logistics services.
- Postal services demand has high degree of fluctuations.
- The postal services are composed of a number of "*partial*" services that are temporally and spatially arranged to fulfill their ultimate purpose. In relation to their quality, the above means that it is formed as a kind of synthesis (sum) of the quality characteristics of the composite services and their optimal spatial and temporal ordering.
- The provision and consumption of the postal service takes place as a unified time and space process, which in relation to its quality means that it cannot be assessed

at the time of sale (purchase). The customer "*buys a promise of a subsequent servic*e" and takes a certain dose of risk.

- Postal services are personalized services. They result from the interaction between two or more subjects. In terms of quality, this means that it depends to a great extent on the human factor (contact staff, back office employees, dispatchers, and customers).
- A postal service is a complex and varied service both from the point of view of operators and consumers. It is a variable, integrated service and, last but not least, is an information rich service. This is what makes the postal services sector particularly suited to the application of modern Information and Communication Technology (ICT) achievements.
- The use of ICT is a source of efficiency in delivering postal services. For example, customers in a self-service situation do a certain job, which increases the efficiency of the process, saving labor costs for the organization providing postal services.
- Postal services are characterized by high flexibility and orientation to the specific needs of consumers. Compliance with customer requirements refers to the necessity and the possibility of changing the service in order to meet the requirements and meet the needs of each individual customer.
- Postal services are services with a low level of customer contact, which determines the expected high efficiency of the service delivery process. However, customers play a significant role in the service delivery, thanks to the capabilities of modern technology, enabling traceability, changing the direction of movement, etc.
- Postal services are a combination of physical sites and services. Therefore, service satisfaction can be said to be the sum of the satisfaction of the individual elements or attributes of all the services that form the service.

FOURTH INDUSTRIAL REVOLUTION AND ITS IMPACT ON POSTAL SERVICES

The Fourth Industrial Revolution is defined as a range of new technologies combining the physical, digital and virtuall worlds. It is characterized by it higher levels of automation and data exchange (*Fig. 3*).

The maim characteristics of the Fourth Industrial Revolution can be summarized as follows:

- Humans, devices and systems are connected along the entire value chain;

- The information are available in real time for all players – manufactures, suppliers and customers;
- The value chain can be optimized with respect to different criteria – cost, resources, customer needs.

The shifts related to the advance of the new technologies in all the sectors of the public and social-and-economic living, require the searching and finding of new tools, models, concepts and methodologies, which should be in the basis of the restructuring of the business organizations from the service sector under the conditions of the already started Forth Industrial Revolution (Temelkova, 2017).

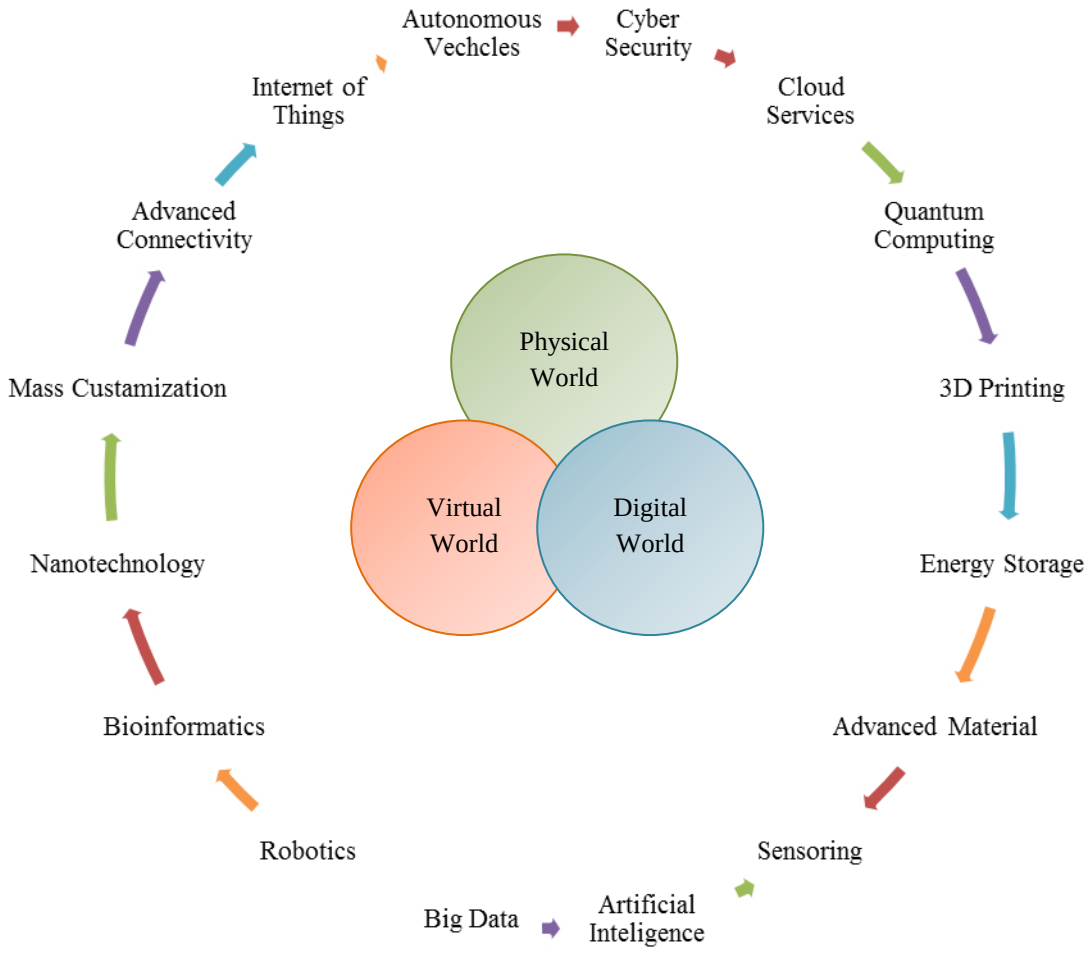

Fig. 3. Drivers of the Fourth Industrial Revolution (adapted by Mark von Rosing, Georg Etzel, Simon Polovina & Wim Paul Remi Laurier, 2017)

Now, the postal sector finds itself in the midst of a disruptive transformation:

- globalization, liberalization, and corporatization increased competition from alternative communication channels (e-substitution).

- the growth and proliferation of other new technologies such as IoT, social media, and cognitive computing.

Postal services have a significant role in the global economy even in the new information society characterized by information technologies. For example, when people communicate and buy through Internet, goods must be delivered to the consumer in physical form. In this case postal service could be seen as a connection between virtual and physical world (Švadlenka, Dobrodolac & Blagojević, 2016).

The Fourth Industrial Revolution in combination with liberalization and globalization has given rise to new customer needs, increased and changing competition as well as new business models in the postal sector.

Information technologies are not only just drivers for postal operators` business processes but they become a core of the postal business.

The biggest driver of ***cloud computing*** in postal sector is Supply Chain Management (SCM). Since the complexity of postal sector has increased there is a need for solutions to facilitate cross-company supply chain management. Cloud computing is being more and more popular in postal sector. However it potential is still not fully utilized. According to AXIT study just about 50% of postal operators already use cloud-based solutions. Most of them use SCM, Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) solutions. Based on the results of the same study the main advantages of using cloud computing in postal sector are: location independent data access; easy integration of partners, quick usability; increase in flexibility; elimination of administrative efforts; easy integration of external systems and easy collaboration.

Quantum related technologies have the potential to massively disrupt a number of areas of IT. Postal market is one of the most globalized markets and it is one of the most dependent on IT markets. Its high dependence on security and regulation of processes and the relentless need to deliver differentiated services, means that disruption brings both risk and opportunity. Quantum technology includes four key areas: imaging, sensing, computing, and communications. Computing and communication includes potential applications in algorithmic trading, fraud detection, and encryption and transaction security.

Now, technology is impacting positively in different stage of the postal process, mostly in sorting and delivery operations. For example barcode speed up postal items soring as they

can be automatically sorted. Many of the postal operators use data-rich 2D codes which contain additional information such as routing instructions, personalized special offers, discounts etc.

3D printing refers to a technology that builds physical object from virtual representation. The 3D technology's greatest potential lies in its capability to simplify the production of highly complex and customizable products and parts. Companies across many industries are showing more and more interest in 3D printing for manufacturing because of the opportunities for greater customization, less waste, and more localized manufacturing and delivery. In postal sector, 3D printing will play a much more prominent role in the areas of spare parts logistics and individualized parts manufacturing. As manufacturers adapt their production processes and supply chains, this will open new opportunities and will also motivate postal providers to find new customer-centric solutions.

A wide range of ***energy storage*** technologies exists. Few of them are market mature or nearly mature, others are still too expensive. In 2009 the International Post Corporation was adopted an Environmental Measurement and Monitoring System (EMMS) programme. EMMS is a postal sector initiative acting to mitigate the impacts of global climate change via a collaborative approach to reduce carbon emissions. According to the International Post Corporation Report for 2017 (Postal Sector Sustainability Report, 2017) participants demonstrate their commitment to improve carbon management. Participants are increasingly switching to 100% renewable electrical power supply, with 30% of posts having made this impressive transition already. Many are also focusing on further improving building energy efficiency. Meanwhile, participants continue to increase their use of alternative-fuel vehicles for postal delivery, with these types of vehicles now accounting for 16% of the postal sectors entire 662,000-strong fleet (International Post Corporation, 2017). Postal sector has achieved €1.5bn cost savings since 2008 through reduced fuel and electricity consumption.

Some of the best practices in postal sector are:

- *An Post* (Ireland) has rolled out an LED Smart Lighting system across its four Mail Centres since 2015. The project is part of a broad reaching energy efficiency drive underway at *An Post*. Through the LED Smart Lighting initiative, existing internal and external lighting systems are being upgraded to reduce power consumption and

improve lighting design. Smart lighting controls are also being installed for both timed and motion sensor lighting, leading to reduced power consumption and extending the life of the new light fittings The project has already generated significant cost savings as well as delivered considerable environmental gains. *An Post* anticipates that energy use will be over 1,000,000 kWh lower in 2017 as result of the LED Smart Lighting initiative. Since the project began in 2015, an overall energy reduction of 14% has been achieved on baseline energy-use and the project is expected to pay back on capital investment within three years of completion.

The same solution was implemented in May 2017 by *Poste Italian*e. The operator started a project to replace fluorescent light fittings in over 1,000 of the post's facilities with LED lighting technology. This on-going initiative aims to reduce electricity consumption from lighting at the post's facilities by around 50%, as well as to substantially reduce energy costs.

- *Austrian Post* implemented its first certified environmental management system at its largest operational unit, the Vienna Letter Centre. The system applies the international standard ISO 14001:2015. During the first few months after the implementation of the management system, an improvement on the environmental performance of the Letter Centre was observed. There has been a reduced demand for electricity and waste separation has improved – mainly due to increased employee awareness of best practice approaches to environmental management. Following these successes, *Austrian Post* has already begun expanding its use of the certified environmental management system.
- *Correos (Spain)* has continued to implement its '*POSTLowCIT*' project, which was initiated in 2016. The project aims is to develop a delivery system with low emissions of CO2, NOx and noise, thereby improving inner-city air quality and reducing congestion.
- In July 2017 *CTT Portugal Post* road-tested the first of a new type of electric vehicle that it hopes to introduce into its already impressive 323-strong 'green' delivery fleet. The electric vehicle has been specially adapted to meet the needs of the postal service. It can carry an estimated 75 kg of deliveries and cover approximately 45 km, a distance equivalent to 230 stops during a standard delivery round.

- *Deutsche Post DHL* implemented a "*Go Green*" environmental protection plan and has already achieved improvement of carbon efficiency of its operations by 30%. Under the Go Green programme, the DHL has introduced numerous emissions-reducing initiatives in recent years like: supplier engagement aimed at optimizing the Group's logistics network; the roll out of energy efficient lighting systems at production facilities and upgrading the Group's aircraft and ground vehicle fleets with newer, more efficient equipment.
- In 2017 *PostNL* began delivering small parcels across Amsterdam using electric-powered delivery bikes, instead of diesel-powered vans. The aim of this initiative is to reduce CO_2 emissions and costs associated with delivery vans, as well as to help to reduce the negative impacts associated with inner-city traffic congestion.

Other technological advance that speed up the whole postal process in ***Radio-Frequency Identification*** (RFID). The RFID enables faster remote processing. RFID is a generic term that is used to describe a system that transmits the identity of an object or person wirelessly, using radio waves. Some areas of RFID applications in postal sector are: item tracking; autosorting and tracking for delivery; control of delivery and collection of postal items from post boxes; management and supervision; personnel and people monitoring. The usage of RFID systems in the postal sector can bring significant savings and competitive advantages while enhancing the quality of operations. One of the most important applications of RFID in postal sector is for traffic and quality management.

The possibilities of using RFID technology are practically limitless. The application of RFID improve and optimize the engagement of the workforce, increase the efficiency of the supply system and reduce human errors and frauds and finally what is most important, it could bring to significant savings (Švadlenka, Dobrodolac & Blagojević, 2016).

Self-service postal loccers offer 24/7 access makes deliveries more efficient by avoiding failing delivery attempts and realizing delivery cost savings. Postal lockers, autonomous containers that can be used to either receive or send a postal item, are among the several popular alternative solutions customers can select to manage their online shopping deliveries or dispatches. For postal operators, investment in postal lockers can reduce costs in the logistics chain, increased delivery efficiency and generate new market opportunities.

Post operators could use the ***IoT*** to create new data-driven businesses, to embedded new digital technologies within the organization, and to extend the current system into a broader digital ecosystem of customers, partners and connected products in order to achieve improvement in customer experience.

The ***Internet of Postal Things*** (IoPT) is ensuring the postal infrastructure with low-cost sensors to enable them to collect, communicate, and act upon a broad variety of data. IoPT can help the postal operators to generate operational efficiencies, to improve the customer experience, and to develop new services and business models.

Over the past five years there has been a significant progress in applications for ***autonomous drones*** in postal sector. In near future drones can play a key role in other solutions postal operators will need, such as monitoring delivery conditions. The advantage of autonomous drones that are fully controlled by software alone is that there is no need to recruit, train and manage pilots. Software-controlled drones are safer, more reliable and offer an on-demand scalable solution at a much lower cost.

One of the challenges of Fourth Industrial Revolution is that quality management will expand from product quality to service quality and brand quality. The utilization of business platform will become an important step toward customer satisfaction for all postal operators.

The postal operators have started the implementation of new digital services in order to extend their portfolio and to find new markets extended the traditional postal market. Most of the digital postal services are directly linked to the traditional postal services and enhanced theirs convenience and value or add a distribution channel (Jaag, Maegli & Morel, 2016).

The new technologies have helped the postal services to become customer-centralized. Consumers are not only better informed about the status of their delivery via tracking, they now also have the option to change the delivery process by redirecting a parcel to a different delivery point, or postpone delivery if they are not at home.

The Fourth Industrial Revolution has dramatically changed social and business communication. In response, postal operators are diversifying and providing new e-services to their customers. E-post services are communication services delivered to customers via ICT means, such as: postal electronic mailbox, electronic stamp, online direct mail, hybrid

mail, postal address validation, address change online, track and trace, electronic notifications, applications on mobile devices, bills management, electronic money transfer, e-commerce web-based customer service and contact, etc.

CONCLUSION

The postal sector has embraced innovation in order to respond to the rapid evolution of consumer needs and to remain competitive in the conditions of Fourth Industrial Revolution. Postal operators have to make significant efforts to adapt their organizational process to digital business.

Technologies will become more and more important for postal services. The new digital means are not able to substitute the physical delivery but they can enhance the process efficiency and flexibility, and reduce the transaction cost.

New digital technologies is having a strong influence on the way postal operators are functioning and providing services and will continue to have greater impact in the future. The extend to witch different postal operators are using digital means vary widely and their potential is still far from fully exploited.

REFERENCES

1. Clotteau N., Measho B., (2016), Global Panorama on Postal Financial Inclusion. Universal Postal Union. www.upu.int/uploads/tx_sbdownloader/globalPanorama OnPostalFinancialInclusion2016En.pdf.
2. Christian Jaag, Martin Maegli, Denis Morel, (2016), Commercial and Regulatory Challenges for Postal e-Services in Switzerland, The Future of the Postal Sector in a Digital World, Springer International Publishing Switzerland 2016, pp. 231-245, DOI 10.1007/978-3-319-24454-9_15.
2. Ebenezer Ankrah, The Impact Of Technology On Postal Services In Ghana, International Journal of Scientific & Technology Research, Volume 4, Issue 01, January 2015, ISSN 2277-8616.
3. Mark von Rosing, Georg Etzel, Simon Polovina, Wim Paul Remi Laurier, Mastering the Fourth Industrial Revolution, Conference: From Industrial revolution to Digital Innovation, November 2017, DOI10.13140/RG.2.2.17437.20967.
4. Schwab, K. (2015). The Fourth Industrial Revolution; What it means and how to respond. Foreign Affairs.

5. Sung Hyun Park, Wan Seon Shin, Young Hyun Park & Youngjo Lee (2017) Building a new culture for quality management in the era of the Fourth Industrial Revolution, Total Quality Management & Business Excellence, 28:9-10, 934-945, DOI: 10.1080/14783363.2017.1310703.
6. Švadlenka, L., Dobrodolac, M., Blagojević, M. (2016), Application of Tracking Technologies in the Postal System, ICTTE 2016: proceedings of the 3rd International Conference on Traffic and Transport Engineering.
7. Temelkova, M. (2017), Development of Controlling in the Organizations from the Service Sector under the Conditions of the Fourth Industrial Revolution, International Journal of Advanced Research in Management and Social Sciences, Vol. 6, No 3, March 2017, pp. 28 – 43, ISSN 2278-6236.
8. Universal Postal Union, (2017), Regional Development Plan 2017-2020, Postal Networks: Actors in the Social and Economic Development of the Africa Region.
9. International Post Corporation, (2017), Postal Sector Sustainability Report 2017 – Moving towards a low-carbon delivery industry.