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INFORMATION AND COMMUNICATION TECHNOLOGY AS A TOOL FOR INCREASING COMPETITIVENESS IN THE PRINTING INDUSTRY

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The study defines the role of information and communication technologies in the economy of the XXI century. It identifies the relationship between increasing competitiveness and the development of information and communication technologies in a printing company. The authors suggest that the basis for ensuring the competitiveness of a printing company is the actualisation of the role of information and communication technologies in the printing industry, as well as the following aspects of activity: automation and digital technologies; production of personalised printed products; use of electronic communication systems; application of information technologies that allow creating innovative printed products with complex design. The authors draw attention to the fact that it is important for the management to take into account potential problems when introducing innovations based on optimising the use of a complex of information and communication technologies in a company. Careful planning, analysis and assessment of possible consequences of implementation, openness to change and readiness for continuous improvement are general recommendations for the management of a company. In the view of the team of authors, particular attention should be paid to the ways in which technologies can contribute to the design and production of print products: 3D printing: using 3D printing technologies to create unique objects and parts that would be difficult or impossible to produce in any other way; Augmented Reality (AR): using AR to design printed products allows the creation of interactive elements that can interact with consumers' smartphones or tablets; interactive QR codes: embedding QR codes in printed products allows consumers to quickly obtain additional information about a product or company by following a link or scanning a code; The article concludes that information and communication technologies open up new opportunities for the development of the printing industry, helping companies to adapt to rapidly changing market conditions and meet the needs of modern consumers.

Keywords: *printing industry, information and communication technologies, market, company's competitiveness, competitive advantage, digital printing, digital economy.*

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Formulation of the problem in general terms. In today's highly competitive printing industry, information and communication technologies play a critical role in gaining a competitive edge. Printers can increase productivity, reduce costs, improve product quality and speed up production processes by using high-tech solutions and the latest digital technologies. The latest technologies, such as digital printing, automated packaging systems, high-speed presses with autonomous quality control, and many others, allow printers to be more efficient, competitive, and flexible in responding to the demands of the modern marketplace. It is also important to be able to adapt to rapidly changing technologies and requirements, and to be actively involved in innovation and continuous improvement of production processes. Companies that successfully implement the latest technologies and strategies have a better chance of maintaining and increasing their competitive advantage in the printing industry.

Analysis of recent research and publications. Various aspects of this problem have been the subject of study and presentation in the works of Ukrainian scientists, such as I. Yatskevych, N. Krasnostanova [1]; V. Skiba [2]; V. Senkivskyi, R. Kozak [3]; R. Zagorodnii, T. Rozum [4]; Y. Koloiz [5]; A. Kudryashova [6]; M. Kolosnichenko [7]; O. Grigoriev, O. Vovk, I. Chebotareva, Y. Deineko [8]; O. Pushkar [9]; B. Durniak, V. Tkachenko, I. Chebotareva [10]; M. Chepeliuk [11]; S. Bondarenko, N. Hryban [12]; I. Davidiuk [13]; L. Shemchuk [14]; Y. Vorzhakova [15].

Formation of the objectives of the article. The purpose of the study is to determine the role of information and communication technologies and to identify the interrelations between the increase of competitiveness and the development of information and communication technologies in a printing house.

Results of the study. Competition is the basis for the functioning of market mechanisms that contribute to enriching, expanding the range and improving the quality of goods and services, as well as to shaping competition policy. At the same time, it is an important component of a market economy, primarily in terms of meeting market needs, winning competition for consumers and ensuring sustainable profits. Competitiveness is one of the key indicators used to manage a company [15].

L. Shemchuk believes that the competitiveness of an enterprise is a relative concept. At the level of a particular region an enterprise may have certain advantages, and in the whole country it may be uncompetitive. Therefore, competitiveness of an enterprise should be considered as a relative ability of an enterprise to use market and resource opportunities to ensure its profitable activity, to meet the constantly growing specific needs of consumers in comparison with competing enterprises in a given market. The competitiveness of an enterprise is a system of categories consisting of the following elements: the efficiency of the enterprise's functioning both on the domestic and foreign markets; the resource and cost status of the enterprise, which reflects the efficiency of the use of resources and working capital over a certain period of time; the efficiency of product sales with adequate profitability of sales and competitiveness of goods in terms of price and quality of products; the efficiency of the use of all types of resources and the efficiency of the enterprise's functioning [14].

The main way to increase the competitiveness of a company is to organise effective innovation activities of the company. These activities should be based on the marketing strategy, organisational and technological preparation for the production of high-quality products [13]. We believe that information and communication technologies play a special role for a printing company.

Here are some of the most important aspects of the role of information and communication technologies in the printing industry and their impact on the competition and the competitiveness of the company:

1. Automation and digital technologies: companies can produce printed products more efficiently and quickly, reduce labour and material costs, and respond quickly to changes in demand through the use of digital printers, automated printing presses, and software.

2. Personalisation: information technology provides additional opportunities to attract customers and improve the customer experience by enabling printers to produce personalised printed products.

3. Electronic interaction: companies can conduct business with customers and suppliers more efficiently and cost-effectively through the use of electronic communication systems.

4. Innovation and design: the use of information technology enables the creation of innovative printed products with sophisticated design and high quality, which helps to differentiate from competitors and attract the attention of consumers.

As a result, information and communication technologies are opening up new opportunities for printers to attract customers, optimise production processes and increase their competitiveness in the marketplace. To ensure stable development and successful competition, it is important to constantly improve your technology and monitor new trends in this area.

Let's take a closer look at the areas that have been identified. Automation and digital technologies are the first area. Providing quick and easy access to services via the Internet is at the heart of the digital economy. Digital technologies help to reduce costs, leading to lower prices for goods and services for end consumers. Productivity is increased and financial and labour costs reduced through the development and implementation of modern information technology. This in turn results in improvements in product quality and an increase in profits.

It is important for management to consider the potential problems they may face when implementing digital technologies in an organisation: 1. Technological innovations (caused by the technology itself) that may be used and adopted by stakeholders (customers, competitors, etc.) without a proper understanding of their potential and capabilities. This includes technologies such as artificial intelligence, edge computing, virtual and augmented reality, blockchain and others. 2. Customer (stakeholder) behaviour

and needs. It is important to note that this issue does not necessarily have to do with the technology, but can be the result of consumer demand for products (services). For example, some consumers want simpler ways to transact without using the internet or complex software tools. 3. Innovation and invention. The emergence of innovations and inventions that create new realities (products, services, jobs) and entirely new approaches to solving business problems and meeting consumer needs. 4. Ecosystem nature. Companies are part of broader ecosystems: business, social and natural ecosystems in which enterprises and consumers function and interact [1]. Careful planning, analysis and assessment of the possible impact of digital technologies, as well as openness to change and readiness for continuous improvement, are general recommendations for the enterprise management.

Today's production automation systems can be divided into the following categories 1) total automated enterprise management systems for a wide range of activities (e.g. SAP, Microsoft Dynamics AX, 1C and others) and enterprise management systems for the printing industry (e.g. Prinect Prinance, ASystem, PrintEffect, 1C:Enterprise. Printing and others); 2) integrated enterprise and workflow management systems (e.g. Prinect); 3) workflow management systems (e.g. Prinect Workflow, Agfa Apogee, Kodak Prinergy and others) [2].

The printing stage is one of the longest and most complex stages in the execution of an order along a technological route. For the successful production of printed products, various technological and production features have to be taken into account at this stage. A computerised publishing system (CPS) and a direct-to-plate system (DTP) are the main components of technological support in the prepress stage. Most modern computerised publishing systems are based on the principle of an "open" system, which allows them to adapt quickly to changes and be as flexible as possible when production tasks change. Typically, a CPS includes dedicated workstations, information inputting and outputting devices [3].

Today, the dominant technology in plate making is Computer-to-Plate (CtP), which has many advantages such as reduced plate making time, improved image quality, automation of the plate making process, reduced consumables and improved environmental conditions. There are currently three main CtP technologies that are the most popular, which differ in the composition of the forming material and the exposure source: violet laser diodes and infrared laser diodes [4].

In addition to traditional printing on presses, numerical printing systems are becoming increasingly popular, used as a separate component of technological equipment or in combination with modern combined (hybrid) printing systems. Electrographic and inkjet systems are among the most popular solutions. For the production of short runs, digital printing systems are most effective. Electrographic digital presses are increasingly approaching offset presses in terms of print quality. However, they are only competitive for short and some medium runs due to higher printing costs, limited choice of substrates, slower printing speeds and less consistent quality. Traditionally, inkjet systems have been used to print large format products or can be used as an additional module to personalise printed materials [5].

A wide variety of production operations and associated equipment (modules, machines, units, systems) characterise post-press processes. Therefore, the efficiency of post-processing processes depends not only on production capacities, but also on the logistical interaction of technological supporting elements used in this stage of production [6].

It should be noted that today the increase in productivity of production processes is a result not only of the increase in productivity of equipment, but also of the increase in the degree of automation of additional operations for preparation of production systems. Increasing labour productivity, reducing production costs, creating a flexible workflow, reducing the number of employees and the production area are the main goals of modern technologies, production systems and management methods.

As far as personalisation is concerned, information technology is really opening up new opportunities for printers to produce personalised printed matter. Personalisation makes it possible to create a unique product for each customer, taking into account his or her individual needs, preferences and other characteristics. This can be the case with the design of brochures, booklets, catalogues, magazines, advertising materials and other types of print products. With personalised print materials, you can attract more attention and interest from your customers because they receive individualised materials that meet their needs. This can increase the effectiveness of marketing and advertising. It can also increase sales and improve customer satisfaction [7].

According to forecasts, the demand for the production of advertising posters, catalogues and various posters has decreased significantly and their circulation is decreasing daily. There is a belief among customers that online advertising has a greater reach, so there is no point in outdoor advertising. Nevertheless, the demand for promotional products as well as for notebooks and business cards is expected to remain almost the same. However, packaging products such as bags, labels and other related products are expected to become the undisputed market leader [8].

With the help of modern information technology, printers can quickly and efficiently produce personalised printed products using data about customers, their preferences and previous purchases. This helps to increase the company's competitiveness. It also ensures that each customer is treated individually.

Using electronic communication systems in the printing industry allows companies to increase the efficiency and cost-effectiveness of business communications with customers and suppliers. Here are some of the benefits of this approach: 1. Speed and convenience: electronic communication allows messages to be transmitted instantly, facilitating the rapid exchange of information between parties. In addition, electronic communication is convenient and can be done anytime, anywhere. 2. Time and cost savings: the use of electronic communication systems

reduces the amount of time spent on business negotiations, the sending of documents, the negotiation of terms and conditions, etc. It also reduces the cost of telephoning, postage and other expenses associated with traditional methods of communicating. 3. Storing information: electronic communication allows you to store and archive all business letters, correspondence, contracts and other documents on electronic media, making them easier to find and accessible at any time. 4. Quality of service improvement: companies can respond quickly to customer and supplier requests, streamline ordering and delivery processes, and increase customer satisfaction through the use of electronic communications.

Especially in the current environment, standards in the field of printing and publishing are changing rapidly [9; 10], not only in terms of production technologies, but also in terms of communication and information dissemination methods. The use of electronic communication systems is becoming increasingly widespread in these industries and is an important element of modern activity.

Electronic communication systems include electronic file-sharing platforms, e-books, e-journals, web pages, social networks and other online sources. These tools allow you to disseminate information effectively, to promote goods and services, to engage your audience, and to communicate with your readers and customers.

There are new opportunities for a creative approach to content creation and distribution through the use of electronic communication systems in printing and publishing. Online publications, electronic catalogues, digital versions of books and magazines – they all contribute to increased flexibility and speed in the production and distribution of publications. But with the benefits of electronic communication systems come challenges, such as ensuring digital security, choosing the right platforms and tools, and supporting and training staff to work with new technologies.

We also support Chepelyuk's ideas about the importance of promoting entrepreneurship in digital sectors and industries that use digital technologies for local value creation. In many developing countries, there are a number of barriers to the expansion of digital businesses in a number of different sectors. Global digital companies are already competing in the most promising sectors that offer opportunities for increased production in digital industries. In order to serve local markets, digital enterprises in developing countries often have to use solutions that combine digital and analogue technologies, which are more dependent on the physical infrastructure than on the technological solutions that are used on digital platforms [11].

The intensification of the introduction of modern technologies at all levels of the economic system requires the expansion of existing practices and institutional forms. This is due to the fundamental heterogeneity of the economic environment in which printing companies operate. Therefore, in order to remain competitive in the market, it is important to constantly improve their knowledge and to comply with modern standards in these areas.

When dualism of innovation and design is concerned, the current capabilities of digital printing are incredibly impressive. We can achieve incredible effects with the latest computers and digital printing equipment. Brochures, posters and desk calendars look spectacular and attractive due to the latest advances in computer image processing, preparation and digital printing. High quality colour printing not only reproduces colours as close to the original as possible, but also opens up new artistic possibilities that enhance the expressiveness of designed objects. The latest colour separation technologies in the printing industry ensure a high quality transfer of colour and tonal images to almost any type of media [12].

Using information technology in the design and production of printed products allows you to create innovative and unique products that stand out in the marketplace and attract the attention of consumers. Here are some of the ways that technology can be part of the design and production of print products: 1. 3D printing: using 3D printing technology allows you to create unique objects and parts that would be difficult or impossible to produce using other methods. This can be useful for creating original packaging, promotional materials, etc. 2. Augmented Reality (AR): using AR in print design allows you to create interactive elements that can interact with consumers' smartphones or tablets. For example, to enhance audience interaction, virtual objects or videos can be placed on printed materials. 3. Interactive QR codes: by embedding QR codes in print products, consumers can quickly access additional information about a product or company by following a link or scanning a code. 4. Digital printing: digital printing allows to personalise products, make quick design changes and produce short runs at low cost.

It should be emphasised that the new equipment used in digital printing makes it possible to develop areas previously thought to be impossible. Now even small printers equipped with the latest technology can compete with large companies in terms of both quality and volume of full-colour printed products. In general, combining information technology with design in the production of printed products can help to increase creativity, improve product quality and attract consumer attention. This can be a competitive advantage in the marketplace.

Conclusions. Automation and digital technologies, the production of personalised printed products, the use of electronic communication systems, and the use of information technologies to create innovative printed products with complex designs are the basis for ensuring the competitiveness of a printing company.

One of the main ways in which Information and Communication Technologies (ICT) have affected the printing industry is by helping to automate processes. Companies can now produce high quality print in a fraction of the time and at a fraction of the cost of traditional methods with the advent of digital printing technologies. This has allowed companies to streamline their operations, reduce the time taken to produce and ultimately stay ahead of the competition.

Businesses can also personalise their products and services to better meet the needs of their customers through the use of information and communication

technologies. With the help of digital printing, companies can now offer customised printing solutions that are tailored to each customer's individual preferences. This level of personalisation has helped companies to stand out from the competition in a crowded marketplace, to attract new customers and to retain the ones they already have.

The introduction of online platforms for print services is another way in which information and communication technologies have affected the competitiveness of printers today. Customers can now order printed materials online, upload files and track the production of their printed materials directly from their homes.

To sum up, today's market for printing services is saturated and competitive, presenting companies with major challenges in attracting customers, improving product quality, and optimising production processes. In this context, information and communication technologies have a key role to play in helping companies to promote their products and services effectively. In this context, information and communication technologies have a key role to play in helping companies to promote their products and services in an effective way, to attract new customers and to maintain relationships with existing ones. By helping companies adapt to rapidly changing market conditions and meet the needs of today's consumers, information and communication technologies open up new opportunities for the development of the printing industry. It is therefore important to learn how to use these technologies effectively and creatively. This will ensure your company's success in a highly competitive environment.

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ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНІ ТЕХНОЛОГІЇ ЯК ІНСТРУМЕНТ ПІДВИЩЕННЯ КОНКУРЕНТОСПРОМОЖНОСТІ У ПОЛІГРАФІЇ

У дослідженні визначено роль інформаційно-комунікаційних технологій у економіці XXI ст. та виявлено взаємозв'язок підвищення конкурентоспроможності з розвитком інформаційно-комунікаційних технологій на поліграфічному підприємстві. Висловлюється думка, що підґрунтям забезпечення конкурентоспроможності поліграфічного підприємства є актуалізація ролі інформаційно-комунікаційних технологій у поліграфічній галузі, а також наступні аспекти діяльності: автоматизація та цифрові технології; виробка персоналізованої друкованої продукції; використання електронних систем комунікації; застосування інформаційних технологій, що дозволяють створювати інноваційні друковані продукти зі складним дизайном. Звертається увага на те, що під час впровадження інновацій на основі оптимізації використання комплексу інформаційно-комунікаційних технологій на підприємстві керівництву важливо враховувати потенційні проблеми, з якими вони можуть зіткнутися. Загальною рекомендацією для керівництва підприємства є ретельне планування, аналіз та оцінка можливих наслідків впровадження, а також відкритість до змін та готовність до постійного вдосконалення. Колектив авторів вважає, що особливу увагу слід вділити способам, які допомагають інтегрувати технології в дизайн та виробництво друкованих продуктів: 3D друк: використання технології 3D друку дозволяє створювати унікальні об'єкти і деталі, які було б складно або неможливо виготовити іншими способами; розширена реальність (Augmented Reality, AR): застосування AR у дизайні друкованих продуктів дозволяє створювати інтерактивні елементи, які можуть взаємодіяти зі смартфонами чи планшетами споживачів; інтерактивні QR-коди: вбудовування QR-кодів у друковані продукти дозволяє створити можливість для споживачів швидко отримати додаткову інформацію про продукт або компанію, перейшовши за посиланням або сканувавши код; цифровий друк: використання цифрового друку надає можливість індивідуалізувати продукцію, швидко змінювати дизайн та виводити невеликі тиражі без значних витрат. У висновках зазначено, що інформаційно-комунікаційні технології відкривають нові можливості для розвитку поліграфічної галузі, допомагаючи підприємствам пристосовуватися до швидко умов ринку, що змінюються та задовольняти потреби сучасних споживачів.

***Ключові слова:** поліграфія, інформаційно-комунікаційні технології, ринок, конкурентоспроможність підприємства, конкурентна перевага, цифровий друк, цифрова економіка.*

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