

USING INFORMATION TECHNOLOGIES TO MANAGE PRINTING PRODUCTION: INTEGRATION AND OPTIMISATION BASED ON THE SYSTEM-PROCESS APPROACH

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Makatora A. V., Makatora D. A., Zenkin M. A., Kubanov R. A. Using Information Technologies to Manage Printing Production: Integration and Optimisation Based on the System-Process Approach

Taking into account the characteristics of the system-process approach, the study considers the importance of the use of information technologies in the management of the production of printed products. The information structure is considered to be an organised system for collecting, processing, storing and distributing the necessary information required for management decision making. This structure aims to ensure that the information is available, accurate and relevant, which is required to manage the production process. By considering the interrelationships of all elements of the production process and establishing optimal information exchange procedures to achieve management objectives, the system-process management approach is used. This helps to improve coordination between the company's departments. It also reduces production time and increases the level of quality and productivity. A wide range of tasks, from order processing and preparation of production documentation to control and analysis of production results, are involved in the creation of a company's management information structure. Production planning, customer invoicing and scheduling of production processes are also important aspects of management. They help to ensure an efficient production process and customer satisfaction. A comprehensive system of information and management components is used to create and use an information structure for managing the production of printed products based on a system-process approach. These components include information technology, production process management systems, and logistics process management systems. The aim is to automate and optimise production processes in the printing industry. In particular, it is possible to optimise the processes of interaction between customers and producers through the development of print production using information technologies and automated management systems. This helps to improve the quality of the service and to make management decisions on a more informed basis. The study notes that effective operational management of receiving orders in the printing industry is critical to running a successful business. Key elements of this process include the proper collection and management of information. Initial data plays an important role in order acceptance and fulfilment, such as customer requirements, requirement structure, financial conditions and order volume. This information enables you to communicate effectively with customers, understand their needs, and estimate profitability and cost to produce. Key aspects of production management include responding quickly to changes in demand, optimising processes and fulfilling orders on time. In order to maintain the efficient functioning of the company, it is important that the data is current, updated and accessible to all parties involved in the process. It is concluded that a properly organised information structure based on the system-process approach is an important component of successful print production management. It contributes to the optimisation of work processes and increases the productivity of the company.

Keywords: management of printing production, information technologies, information structure, system-process approach, management decision, economic development, competition.

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Макатьора А. В., Макатьора Д. А., Зенкін М. А., Кубанов Р. А. Використання інформаційних технологій в управлінні виробництвом поліграфічної продукції: інтеграція та оптимізація на основі системно-процесного підходу

У дослідженні розглянуто важливість використання інформаційних технологій в управлінні виробництвом поліграфічної продукції з урахуванням особливостей системно-процесного підходу. Інформаційна структура розглядається як організована система збору, обробки, зберігання та розповсюдження інформації, необхідної для прийняття управлінських рішень. Ця структура спрямована на забезпечення доступності, точності й актуальності інформації, що є важливим для успішного управління виробництвом. Системно-процесний підхід управління передбачає врахування взаємозв'язків усіх елементів виробничого процесу та встановлення оптимальних процедур інформаційного обміну для досягнення поставлених цілей управління. Це дозволяє поліпшити координацію дій між підрозділами підприємства, скоротити час на виробництво продукції, підвищити рівень якості та продуктивності виробництва. Формування інформаційної структури управління підприємством включає в себе різноманітні завдання, починаючи від обробки замовлень та підготовки виробничої документації та закінчуючи контролем та аналізом результатів виробництва. Планування виробництва, взаєморозрахунки з клієнтами та диспетчеризація виробничих процесів також є важливими аспектами управління, які допомагають забезпечити ефективний виробничий процес і задоволення потреб клієнтів. Формування та використання інформаційної структури для управління виробництвом поліграфічної продукції на засадах системно-процесного підходу передбачає використання комплексної системи інформаційно-управлінських компонентів. Ці компоненти включають інформаційні технології, системи управління виробничим процесом та логістичну систему управління процесами, які спрямовані на автоматизацію й оптимізацію виробничих процесів у сфері поліграфії. Зокрема, розвиток поліграфічного виробництва за допомогою інформаційних технологій та автоматизованих систем управління дозволяє оптимізувати процеси взаємодії між замовниками та виробниками. Це сприяє поліпшенню якості обслуговування та прийняттю більш обґрунтованих управлінських рішень. У дослідженні зазначено, що ефективне оперативне управління прийняттям замовлень у поліграфічному виробництві є критично важливим для успішної діяльності підприємства. Належне збирання й управління інформацією є ключовими елементами цього процесу. Вихідні дані, зокрема вимоги клієнта, структура вимог, фінансові умови та обсяг замовлення, відіграють важливу роль у прийнятті та виконанні замовлень. Інформаційна база дозволяє ефективно комунікувати з клієнтами, розуміти їхні потреби, оцінювати прибутковість і вартість виробництва. Швидке реагування на зміни у вимогах, оптимізація процесів тачасне виконання замовлень є важливими аспектами управління виробництвом. Забезпечення актуальності даних, їх оновлення та доступ для всіх учасників процесу допомагає підтримувати ефективне функціонування підприємства. Зроблено висновок, що правильно організована інформаційна структура на засадах системно-процесного підходу є важливим компонентом в успішному управлінні виробництвом поліграфічної продукції, що сприяє оптимізації робочих процесів та підвищенню продуктивності підприємства.

Ключові слова: управління виробництвом поліграфічної продукції, інформаційні технології, інформаційна структура, системно-процесний підхід, управлінське рішення, економічний розвиток, конкуренція.

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Creating an information support structure based on a system-process approach is one of the key aspects of successfully managing the production of printed products. This approach will help printing companies to effectively manage produc-

tion processes, optimise costs and ensure high quality of final product. The constant development of printing technologies, increasing market competition and consumer demands for speed, quality and innovation in printed products should be taken into account when

considering the relevance of the research topic. Ensuring the availability and relevance of data required for strategic and operational management decisions is the objective of the information structure for managing the production of printed products. Companies can streamline production processes, reduce time spent on product preparation and production, lower inventory costs, and optimise equipment utilisation by adopting a systems-process approach to management.

Today, an important step in managing the production of printed products is the use of modern information technologies and software tools. These tools automate the processes of data collection, processing and analysis. Implementing these tools allows companies to interact effectively with different departments, establish effective control over production processes and respond quickly to production changes.

By applying a systematic process approach to managing the production of printed products, companies can improve the predictability of production processes, identify risks and opportunities for optimisation, and ensure high quality products and timely delivery to customers. This enables companies to gain a competitive edge in the marketplace and help ensure that the business continues to thrive in the long term. The need to respond quickly to changes in production conditions and customer preferences is one of the main challenges for printing companies. Companies can receive and analyse operational data to make fast and informed decisions through the information structure of management support. This approach is a key factor in the maintenance of competitiveness and a high level of customer satisfaction.

In general, it is crucial for modern companies to create an information structure for managing the production of printed products based on a system-process approach. This allows introducing innovative management approaches, reducing production costs and time, and improving product quality and reliability. In the current environment of globalisation and competition, careful planning and organisation of information flows enables companies to respond effectively to market challenges and ensure sustainable development.

In the works of Ukrainian and foreign scientists various aspects of this problem have been studied and presented, e. g: O. Pushkar [1]; V. Shpak [2; 12]; B. Durniak, V. Tkachenko, I. Chebotareva [3]; O. Vovk, I. Chebotareva, D. Polenok [4]; E. Stefan et al. [5]; I. Yaremko, O. Glushko [6]; O. Gavrysh, V. Hrytsenko, A. Yukhymets [7]; I. Ogirko, M. Smolynets, A. Chernenko [8]; L. Yatsenko [9]; I. Balaniuk, O. Hryhoriv, T. Ivaniuk [10]; P. Khomyn [11]; I. Olifirenko [13]; K. Prib [14]; I. Kornilova, V. Sviatnenko [15]; V. Morf-

luk-Shchur [16]; L. Fit, M. Shashova [17]; O. Palyukh [18]; S. Hutkevich, L. Shenderivska [19]; I. Marchuk, K. Zolotukhina [20]; G. Jordan [21]; O. Hrigoriev [22]; I. Markina, D. Diachkov [23]; O. Chekotovska [24]; A. Zakharchenko [25]; R. Fedorovych [26].

The *purpose* of the study is to analyse and substantiate the applied need for the use of information technologies in the management of printing production with a view to the integration and optimisation of organisational and economic processes on the basis of a system-process approach.

The information structure for the management of printing production based on the system-process approach is an organised system for the collection, processing, storage and distribution of information necessary for the management of printing production processes. By ensuring the availability, accuracy and relevance of the information needed to make management decisions, this information structure aims to support the efficient and optimised management of production processes. The interrelationships of all elements of the production process and the establishment of optimal information exchange procedures to achieve management objectives are considered in the system-process approach.

An important role in the operation of printing companies is played by the need to create an information structure that ensures effective management of the production of printed products based on the system-process approach. The creation of such systems helps to solve a number of tasks, including the processing and calculation of printing orders, preparation of production documentation, mutual settlements with customers, planning and dispatching production, production accounting, analysing the results, and on-line control over the processing of orders [1].

How to carry out and charge for a job. A print job is a process for the production of various types of printed materials, such as leaflets, brochures, postcards, catalogues, business cards, etc. To place a print job, you first need to determine the type of product, the quantity required and the technical requirements for printing it [2]. For example, to print business cards, you need to specify the number of copies, the paper used, the colours required and the type of printing.

Concerning producing documentation. A key stage in the production of printed materials is the preparation of production documentation. This process includes the creation of technical drawings, layouts, material specifications and other documents that are necessary for the successful completion of printing. The production documentation is the key to the prevention of errors and the guarantee of excellent quality of the final product. Analysing the customer's

needs and requirements is the first step in preparing production documentation for printing. It is necessary to determine the type of product to be printed, its dimensions, colours, materials, quantities and other technical details. The next steps in preparing the documentation are determined by clearly formulated requirements. Once the requirements have been analysed, an important step is to develop a layout for the printed material. The layout should reflect the position of the text, graphics, photographs and any other elements on the level where further printing will take place. When creating a layout, it is important to consider the technical features involved in printing. Production documentation in the printing industry also includes technical drawings that provide a detailed description of the size, shape and location of elements on the document. This step helps to ensure the accuracy and high quality of the printing process. The printing plate is made and the equipment is set up on the basis of the technical drawings. Technical specifications for materials used in printing may also be included in the production documentation. This information, which affects the quality and length of the print run, is important for selecting the right materials. Choosing the right materials helps to achieve the best results [3].

An important part of working in the printing industry is billing customers and preparing payment and shipping documents. This includes agreeing the financial terms of working with the customer, issuing invoices, checking payment for services rendered, and confirming the delivery of finished products. To ensure smooth order processing and positive customer relations, effective invoice management is essential. In order to successfully settle accounts with customers, it is necessary to take into account the terms and conditions of the contract and the agreed prices for the services. Future misunderstandings and conflicts can be avoided by setting clear terms of cooperation. To maintain the financial stability of the company, it is important to issue invoices on time and control their payment. Preparing payment documents in the printing industry includes preparing completion certificates, issuing invoices for payment, and preparing shipping documents for delivering finished products. Each document must be prepared accurately. It must contain all the necessary information for convenient and fast processing. In order to ensure the financial stability of the company, an effective system of invoicing customers is important. The company's liquidity can be maintained and overdue debts avoided by timely invoicing and payment control. Constant control over the accounts is carried out in order to ensure mutually beneficial conditions of cooperation and a positive experience of cooperation with customers [4].

The planning and scheduling of production in the printing industry is an important stage that contributes to the efficient operation of the company. This process involves allocating production tasks, controlling work performance, setting production deadlines and organising the workflow to achieve maximum productivity. Planning is the basis of efficient production, and scheduling is the means by which you coordinate and control production processes. Analysing production capacity, material and financial resources, determining the volume of orders, their deadlines and priorities is the first step in production planning in the printing industry. This information is used to draw up a production plan. This plan includes the distribution of work between production units, the timing of each stage of production and the control of its execution. Production scheduling in the printing industry involves the organisation of the workflow, the distribution of tasks among employees, the monitoring of the completion of work on time, and the resolution of ongoing tasks and problems that arise during production. By coordinating the actions of employees and resolving problems in a timely manner, the dispatcher is responsible for ensuring the reliability and efficiency of the production unit. The company can optimise production processes, increase productivity and reduce costs through effective production planning and scheduling. With the implementation of a planning and scheduling system, the organisation of workflows and problem solving in production is faster and more efficient [5].

An important part of effective production management in the printing industry is production accounting. It involves the systematic monitoring of the production process, the recording of production cost, the planning of production capacity and the analysis of production activity. Proper production accounting enables a company to control its production processes, to determine the efficiency of its production and to make informed management decisions. Production cost accounting is one of the key aspects of production accounting in the printing industry. This includes the accounting of raw materials, consumables, labour, energy and other costs associated with production. Accurate production cost accounting enables a company to manage costs, identify opportunities for optimisation of production processes and ensure efficient use of resources. Another important aspect of production accounting in the printing industry is production capacity planning. This includes the determination of the optimal size of production facilities, the planning of production processes, the allocation of production tasks and the determination of resource requirements. Proper planning allows the company to make efficient use of production facilities, avoid overproduction and

maintain stable production activity. The analysis of production activities as part of production accounting helps the company to assess the productivity of production processes, the identification of weaknesses and opportunities for optimisation. This analysis enables informed decisions to be made with regard to the improvement of production processes, the increase in efficiency and the improvement of product quality [6].

Calculating planned and actual costs in the printing industry is an important stage in production accounting, allowing the company to determine the cost of producing products and assess their effectiveness. Planned costs include calculating the cost of raw materials, labour and other production costs that should be allocated to producing the planned quantity of products. The actual cost, in turn, reflects the actual costs incurred and the variances from the planned figures. In the printing industry, an analysis of production costs, raw material prices, labour costs, depreciation and other related costs is used to calculate the planned cost of production. Including all costs in the planned cost price allows the company to estimate the cost of producing and set a pricing policy that will cover all costs and generate a profit. The actual cost of production in the printing industry is calculated on the basis of the actual costs incurred during the production process. This indicator reflects the actual cost of production of products and may be different from the planned cost due to differences in prices, costs or production volumes. In the printing industry, you can analyse production efficiency and make management decisions to optimise production processes by comparing planned and actual production costs. If the actual cost is higher than the planned cost, this may indicate inefficient use of resources or increased costs. Therefore, improvements in production processes are required [7].

In the printing industry, a critical aspect of managing the production of printed products is the planning and reservation of materials. Effective material planning allows a company to accurately calculate the various materials such as paper, ink, varnish, etc. needed to produce products. This helps to avoid running out of materials or overstocking, which can cause the company to lose money. Various factors such as production volumes, equipment specifications, production times and customer requirements must be taken into account for effective material planning. In addition, analysis of market trends in material prices and potential risks of material shortages are important. Another important part of cost management is material reservation. Material reservation involves stockpiling materials for immediate use when unforeseen circumstances arise, such as changes in produc-

tion volumes, technical obstacles or changing market conditions. This allows companies to ensure continuous production and avoid delays caused by running out of materials. In the printing industry, planning for materials usage and stockpiling can be improved by using specialised inventory and cost management software. Such systems can automate the processes of planning, reserving and controlling material consumption, reducing the risk of errors and optimising production processes [8].

An important part of managing the production of printed products in the printing industry is paper and materials accounting. It is necessary to keep records of consumed materials, current stock levels, planned purchases and usage in order to ensure efficient production and control material costs. This will enable the company to maintain the necessary stock levels, to avoid overstocking and material shortages, and to optimise the production process. Accounting for paper and other materials in the printing industry can be carried out using a variety of inventory methods, which allow you to check the actual balance of materials in the warehouse and to determine their value. In addition, accounting allows you to control material consumption for specific product types, determine the cost of production for each copy, analyse the efficiency of resource use and plan purchases. Developing a procurement strategy, selecting reliable suppliers, monitoring the quality of delivered products and identifying potential supply problems are also part of managing paper and materials accounting. Effective management of materials accounting will enable you to save resources, to ensure the stability of production and to increase the competitiveness of the company. In the printing industry, the processes of recording, analysing and reporting on material usage can be greatly simplified by using computerised paper and materials accounting software. As a result, the speed and accuracy of the accounting process is greatly increased, errors are avoided and staff time is saved. Automated accounting also helps make informed management decisions by providing quick and clear reports on stock levels and material usage [9].

An integral part of managing a company's production and business activities in the printing industry is the accounting of finished products. It is a process that ensures the accurate determination of the volume of production, quality control and the timely correction of any defects. Finished goods accounting also enables a company to analyse the efficiency of its production processes, to plan the volume of production and to determine its marketing strategy. Determining and recording the cost of manufactured products is one of the key aspects of finished goods accounting. This is im-

portant for calculating the profitability and value of the finished product. In addition, accounting makes it possible to determine the level of demand for a particular type of product and to direct efforts towards the production of the most popular and profitable goods [10]. For the effective accounting of finished products in the printing industry, a variety of approaches and methods are used, such as a bar code system, RFID tags, warehouse accounting software, and other IT solutions. These tools allow you to respond quickly to market changes, automate accounting processes, and simplify the control of finished goods volumes. Finished goods accounting helps companies maintain detailed reports on how much product is moving and where, providing critical information for management decisions. It provides the basis for inventory calculations, market analysis and product demand forecasts. It can also provide early warning of potential product problems and defects, enabling rapid response and rectification.

Operational production reporting in the printing industry is an important tool for the analysis and control of a company's production processes. This type of reporting provides up-to-date information on production volumes, product quality, resource consumption and other key parameters. This information helps management to make informed decisions. Operational production reporting enables you to determine the efficiency of the production processes, to identify and correct any problems in a timely manner, and to plan further actions to be taken in the company. One of the most important aspects of operational production reporting is the comparison of the actual production results with the target results. This analysis allows you to identify any deviations from the plans and to react to them in a timely manner to avoid any potential problems. For example, if the costs of production are higher than planned, this analysis will help you to find out the reasons for this and to take measures to optimise the costs. Operational production reporting provides information on the efficiency of using production resources such as materials, labour, equipment, etc. This enables you to optimise your production processes, control your stock levels and ensure that resources are used efficiently. This helps to reduce costs, improve profitability, and become more competitive by analysing how the business operates. Operational production reporting also allows you to determine the quality of manufactured products through the analysis of quality indicators such as scrap rate, defect rate, compliance with quality standards and others. This helps to improve the company's reputation and customer satisfaction by identifying quality problems in time, taking corrective action and improving product quality [11].

Online order management in the printing industry is an important step in the production process, as it allows customers to place and control their orders online in a quick and convenient way. With online order management systems, companies can automate the order acceptance process, track the progress of orders and provide online interaction with their customers. Controlling the order flow in an online format allows companies to effectively organise working with customers and provide high quality service [13]. Automating the order acceptance process is the first aspect of online order management in the printing industry. With online order management systems, customers can quickly and conveniently select the services they need, specify their technical requirements, and submit their orders for processing. This enables companies to process orders efficiently. It minimises order acceptance and processing time and increases customer satisfaction. Tracking the progress of an order is the second aspect of online order management. Online systems allow companies to track the status of orders in real time. They can monitor the processing and delivery of orders to customers. This enables companies to meet their obligations to customers in a timely and high-quality manner by responding quickly to any delays or problems with order fulfilment. Customer interaction is the third aspect of online order tracking. Online order forms enable companies to communicate effectively with customers, resolve real-time order issues, and provide advice and recommendations. The result is an improvement in customer relations and an increase in customer satisfaction. Ensuring the security of customer data is the fourth aspect of managing the online ordering process. When customer data is transmitted through online systems, organisations need to ensure that the confidentiality and integrity of customer data is protected. An important part of successful online ordering and building customer confidence in the business is protecting personal information and ensuring the security of transactions. In summary, to ensure efficient business operations and customer satisfaction, it is essential to control the progress of an online order in the printing industry. Online order management software enables process automation, order tracking, client interaction and data security. This helps businesses to improve how they operate and to keep customers happy.

Analysing the results achieved in the printing industry is a key stage in the production process, as it allows you to assess the effectiveness of your business and draw conclusions about the results achieved. This analysis includes evaluating financial performance, the quality of products produced, the degree of utilisation of production resources, and assessing competitiveness in the marketplace [28]. By analysing the results, the

company can identify the strengths and weaknesses of its activities. It can also determine strategic development directions and make informed management decisions. The evaluation of financial indicators is the first step in analysing the results achieved in the printing industry. This involves analysing production, revenue, cost of producing, profit and other financial indicators. This analysis helps to determine the efficiency of production processes and the profitability of the business. Assessing the quality of the products manufactured is the second aspect of analysing the results achieved. This involves identifying and analysing quality indicators such as scrap rates, defect rates, compliance with quality standards and customer satisfaction. In terms of customer satisfaction and building a company's reputation in the marketplace, product quality plays an important role. Assessing the use of production resources is the third aspect of analysing the results achieved. This involves analysing the efficiency with which the company uses physical, financial and human resources. This aspect helps to identify opportunities for the optimisation of production processes and the increase of productivity. The assessment of the company's competitiveness in the market is the fourth aspect of the analysis of the results achieved. This analysis includes identifying the strengths and weaknesses of the company's competitive position, identifying opportunities for promoting the market and entering new segments. This helps the company to develop strategies for developing and maintaining its ability to compete. To sum up, the analysis of the results achieved in the printing industry is an important part of the management of a company. In order to achieve success in the printing market, this process helps to identify problematic aspects in the activities, to identify opportunities for improvement and development, and to make informed management decisions [14].

Therefore, a key element in the activities of printing companies is the creation of an information structure for the effective management of print production based on the system-process approach. This approach makes it possible to solve various tasks, including order processing, preparation of production documentation, production planning and online order tracking.

It is important to note that the printing industry has a number of information and management components that play a significant role in ensuring the efficiency and success of production. Some of these components are

1. Information technologies for managing an intelligent publication preparation system that automates the process of preparing printed materials for printing, ensuring the speed, accuracy and quality of this process.

2. A print production management system that controls the production processes on the printing lines, including the preparation of the machines for printing, the control of the print quality and the timely change of inks.
3. A book-binding control system that manages the process of joining together individual blocks of printed material to create a finished printed publication.
4. A spine trimming control system, which manages the process of trimming the edges of a book or publication.
5. A book assembly control system that is responsible for the correct picking, packing and preparing of books for shipping to customers.
6. A book spine gluing management system that controls the gluing of book covers and spines in order to improve the stability and quality of the book.
7. A logistics process management system that ensures the optimal allocation of resources, the control of the supply of materials and of the production processes, as well as the organisation of the shipment of the finished products to the customers.

Let us find out more details. One of the most important blocks in the structure of the hierarchical production organisation is information technology. This is used to manage the intelligent publication preparation system. This component organises the process of preparing print products for printing using modern information technology and software. An intelligent publication preparation system may include such elements as software for layout, image processing and colour correction, packages of fonts for printing and other tools that help to improve the quality and speed of the preparation of materials for printing. To make production more productive and efficient, the information technologies used to manage an intelligent prep system automate many routine processes. They contribute to time and resource savings, as well as product quality and competitiveness [5; 15]. The use of intelligent systems for the preparation of publications enables printing companies to react quickly to changes in market conditions and in the requirements of their customers. These systems help to speed up the process of preparing materials for printing. They also ensure high accuracy and quality of document processing and minimise errors.

Automating the print quality control process is a key component of a print production management system. Modern technology enables real-time monitoring and control of print quality, helping to detect potential defects and ensure high quality finished

products. The print production management system also ensures that the presses are prepared for printing, in addition to quality control. This includes preparing printing plates, setting up machines for different types of printing, ensuring proper inking and monitoring the performance of the equipment. In addition, the system takes into account the need to change the ink in good time during the production run. This is important to ensure consistent print quality and to allow a variety of jobs to run without losing time or quality. Important elements of the print production management system include monitoring ink residues, planning ink changes and carrying them out promptly [16].

An important role in ensuring the quality and efficient preparation of printed publications is played by the block binding process control system in print production. This system is responsible for the process of assembly of individual blocks (sheets or book blocks) into finished books, magazines or brochures [12]. Controlling this process ensures the correct sequence and quality of binding. It also ensures that all the requirements for the final product are met. Automating the block assembly process is one of the key functions of a binding process control system. This helps to reduce production costs and increase labour productivity. It also helps to eliminate errors when assembling publications. In addition, block gluing monitoring and quality control functions can be included in the binding process management system. This allows for early detection of any defects or shortcomings in the binding process, contributing to the production of high quality and beautiful publications. To ensure smooth and continuous production of the final product, the system can also be integrated with other production links such as prepress and book trimming. This increases overall production efficiency by eliminating delays in the production process. Finally, workflow planning and project management control modules can be included in the system. This helps the company's management to be confident that orders will be completed on time and ensures that the company's resources are used rationally.

In order to ensure the high quality and professional appearance of printed products, a book spine trimming management system plays a key role in the printing industry. This system is responsible for controlling the process of trimming the edges of books or publications. This is an important part of the final production stage, after which the finished product is ready for the market. Automating the trimming process is one of the key functions of the book spine trimming control system. This reduces the time and labour required for spine trimming, ensuring accuracy and consistency. Automation helps to eliminate errors and en-

ures high quality trimming for each production unit. In addition, the system can include trimming quality control functions. This allows you to detect and quickly correct any defects or malfunctions in the trimming process. This contributes to the production of high quality and aesthetically pleasing printed products. This is important to meet customer requirements. To ensure a seamless print production process, the block spine trimming management system can also interact with other production links, such as printing and binding. Integrating the system allows you to optimise production processes and ensure a smooth transition from one stage to the next, without delays or interruptions. Finally, modules for planning and controlling the trimming workflow can be included in a block spine trimming management system. As a result, the company can ensure on-time order fulfilment, resource management and high production efficiency. This system ensures high quality finished products by improving the management of the production process.

In the printing industry, a key role in the correct picking, packing and preparation of books for shipment to customers is played by the book assembly management system. This system is a key stage in production. It ensures that each copy of the book meets the customer's requirements and contains all the necessary elements. One of the important functions of a book assembly management system is the automation of the book picking process [17]. This reduces the risk of errors and ensures that books are assembled accurately, containing the correct content and arranged in the correct order. As well as saving time and resources, automation helps to improve productivity and quality. In addition, the system can include modules for the control of book packaging, which allow for the timely detection and correction of any defects or damage during the packaging process. This helps to ensure that the books are transported to the customer in a safe and secure manner and that they remain in excellent condition. In addition, to improve the process of shipping books to customers, the book collection management system can interact with the shipping management system. This helps to optimise the logistics process and ensures that every book is delivered to the recipient at the right time. Finally, book inventory monitoring and warehouse management modules can be included. In this way, you can maintain the necessary stocks of books, avoid unnecessary storage costs and ensure that you have reliable control over production volumes.

An important role in ensuring the high stability and quality of books is played by the spine gluing process management system. This process, in which the covers and spines of each book are glued together with a strong adhesive, takes place at the final stage of book

production. Checking the accuracy of the gluing and ensuring maximum quality of this process is the main purpose of the system. One of the most important functions of the process control system for the gluing of book spines is the automation of the process itself. This ensures that each book is glued to the same quality, efficiently and without errors. Automation is the key to productivity gains and the avoidance of delays in the production schedule. In addition, the system can include gluing quality control modules. These allow you to detect and correct any defects in the spine gluing process in a timely manner. This reduces the number of faulty copies and helps to maintain high quality books. In addition, to ensure efficient use of resources and reduce losses during the spine gluing process, the management system can interact with the materials control system. As a result, the economic aspects of production are maintained and the profitability of the process increases. Finally, the system can include modules for monitoring and analysing book spine gluing quality data. This allows for early detection and correction of potential problems in the process [18]. This contributes to maintaining a high level of book quality and customer satisfaction.

A key tool for ensuring efficient and optimal production of books and other printed materials in the printing industry is a logistics process management system. From allocating resources and controlling the supply of materials to organising the delivery of finished products to customers, this system encompasses a wide range of functions. Reducing costs and optimising production processes are the main objectives of the logistics system. One of the most important functions of a logistical system is to help allocate resources. This means that in order to maximise productivity and reduce costs, the system enables the efficient use of resources, such as human, material and financial resources. Stable production and customer satisfaction are ensured through the optimal allocation of resources. In addition, the logistics system controls the supply of production materials. This includes the timely and accurate delivery of the materials required for book production. The logistics system controls the supply of production materials, including the timely and accurate delivery of the materials necessary for book production, in order to avoid interruptions in production, ensure the smooth running of the process and maintain the high quality of the end product. The logistics system also ensures fast and reliable delivery of books and other printed materials by organising the shipment of finished products to customers. To ensure on-time delivery and customer satisfaction, it optimises logistics processes, including warehousing, packaging and transportation of products. Finally,

a logistics system can improve production and supply chain management through the use of information systems technology [19]. This makes processes more efficient, reduces the risk of errors, and makes forecasting production needs more accurate. The logistics process becomes more automated and transparent through information systems.

It is the complex of these information and management components which make the printing industry work, and whose integration and coordination help to ensure the efficiency, quality and competitiveness of printing companies.

The use of information technology to improve the process of coordinating requirements between customers and producers is a promising area for the development of print production. Tasks such as administrative management, negotiating order conditions with customers, and managing finances and material and technical resources can be handled efficiently by creating hierarchical, multi-level automated systems. In such a hierarchical system, components such as human resources, resources and information (including data and knowledge bases) interact at different levels with the substructures of the automated control system (ACS). In the printing industry, this structure helps to optimise decision-making processes and ensures effective management. Each sub-structure of the ACS is supported in performing its tasks in an efficient and coordinated manner by a clear division of levels in the hierarchical system. Business processes in the printing industry are optimised and the quality of customer service improved by the distribution of responsibilities and resources between the different levels of the system [21].

A key component of the automated management system is the print production information system [27]. This system unites the information space for the internal dialogue between the customer and the producer, as well as for the internal interaction between the customer's requirements and the production possibilities. Solving problems within customer requirements that meet current quality standards is the main purpose of the information system. Taking into account all the requirements specified by the customer, this may include the design of a specific type of printed product. The information system contributes to fast and accurate decision making by automating and facilitating the process of information processing and analysis. The internal dialogue between the customer and the producer through the information system makes it possible to maintain clear communication and mutual understanding between the partners [22].

In particular, it takes place at the highest level of the management hierarchy, where the customer and

the account manager interact, taking into account the behavioural strategy, in the process of agreeing the requirements and capabilities for the production of printed products. This process allows clear requirements to be established and matched with production capabilities, which is important for the successful execution of an order. On the basis of this concept, the management hierarchy has a number of structural and functional levels, of which the intellectual and information dialogue is a key component. In the process of matching requirements and capabilities, this level aims to facilitate productive communication and problem solving. In order to discuss, clarify and make important decisions, the intellectual and informational dialogue involves active interaction between the customer and the account manager. In this process, the analysis and processing of information plays an important role. It ensures effective interaction between the parties. Consideration of behavioural strategy, which may include aspects such as finding optimal solutions, avoiding conflict and ensuring maximum interaction between the parties, is an important part of the intellectual and informational dialogue. In the printing industry, this is an important part of successful project management.

Within this concept, there are several structural and functional levels in the management hierarchy. One of these is the operational level, which manages the receipt of orders from customers. This level involves the complex work of processing orders, tracking their execution and resolving any issues that arise regarding the details of the order. Responding quickly to new orders, gathering and processing information, communicating with clients and clarifying their needs are all part of the operational management of receiving orders from clients. This is particularly important to ensure efficient customer service and to ensure that orders get filled in a timely manner. Liaising with production and other parts of the business to ensure high quality service and production is also an important part of operational management. To avoid delays in order fulfilment and to maintain the company's reputation, coordination between different departments is essential. In general, an important part of managing the production of printed products is the operational management of receiving orders from customers. Its effectiveness depends on the accuracy and efficiency with which orders get processed, which contributes to customer satisfaction and the successful operation of the company [23].

This is a very important element. Various types of information from previous transactions, best practices, product characteristics and customer requirements are collected and structured at the database and knowledge level. This information is used for analysis

of current requirements for new orders and for informed decisions about their fulfilment. The databases and knowledge bases also help to identify and predict order trends. This helps to plan the company's production and resources. The process of matching demand and supply can be maintained and optimised at the most efficient level using the information stored in these databases. To ensure the confidentiality of customer information and the company's technological processes, it is important to remember that access to databases and knowledge must be limited and secure. In addition, to reflect changes in market needs and technological capabilities, these databases need to be constantly updated and improved. In general, to ensure production efficiency, customer satisfaction and overall business success, knowledge databases play a key role in managing the process of matching requirements and capabilities.

Communication with the technological units of print production plays an important role in the process of matching requirements and capabilities between the customer and the account manager at the top of the hierarchy. Because production processes have a direct impact on the quality and timing of work, this interaction is critical to the success of the job. Key components in the production of printed products are the print production technological units. They include a wide range of equipment, machinery and technological processes that are required for the printing, processing and finishing of products. A precise match between customer requirements and the technical capabilities of the production facility is required to make effective use of these assets. To ensure that customer requirements are met and the quality of the products produced is maintained, the interaction between the customer and the production units must be constantly monitored and controlled. This process takes into account the technical characteristics of the equipment, the production conditions and the capabilities for the production of specific types of print products. Optimising the use of process units to ensure efficient production and minimise unforeseen delays or problems is also an important aspect of management. This requires the ability to forecast production requirements, to plan the use of equipment and to allocate resources to ensure the efficient operation of the process units. In summary, an important stage in managing the production of printed products is the interaction between the customer, the job manager and the production process units. This helps to ensure that the customer's requirements get met, that production runs efficiently, and that the products meet high quality standards.

In addition to the technical side, customer and user service is also involved in a successful process of

matching customer requirements with print production capabilities. Because customer satisfaction is the foundation of a successful business, customer and user service is a key element in matching requirements and capabilities. Various service processes such as customer consultation, order processing, conflict resolution and after-sales support are included at this level of the hierarchy. Effective after-sales service ensures mutual understanding between the customer and the manufacturer, contributes to the building of long-term relationships and increases customer loyalty. It also enables us to improve product quality and ensure that our products meet customer expectations through a deep understanding of their needs. Continuous monitoring and analysis of customer reactions to the services provided is part of the process of matching requirements and capabilities in the context of service delivery. This enables us to achieve the highest standards of quality by responding quickly to any shortcomings, correcting them and improving service processes. The basis for successful order fulfilment and the development of partnerships is the interaction between the customer, the order manager and the service department. The active implementation of these approaches makes it possible to maintain a high level of customer satisfaction. It also increases production efficiency and ensures the stable development of the company [26].

It should be noted that the operational system for managing orders received is based on the following initial data:

1. Customer requirements with clearly defined parameters of printed products and quality criteria.
2. Data on the structure of the requirements and their informational characteristics, which are needed to understand and execute the order correctly.
3. Information on the financial conditions of the order, which are necessary for the estimation of the costs and profitability of the production.
4. Order volume data and service parameters that determine the scope of work and order conditions.
5. Operational workflow for each client, containing all the information needed to manage the order and ensure interaction with the client at the level of executing the order.

Let us find out more details. An important component of business management – customer requirements with clearly defined parameters of printed products and quality criteria – forms the basis of the system of operational management of order acceptance. As the basis for all further actions and production processes, customer requirements are the de-

cisive factor for the successful completion of an order. Clearly defined product parameters and quality criteria are the main guidelines for production. They define the technical specifications, design, materials and other elements required to produce products that fully meet the customer's needs and expectations. In order to translate the customer's ideas and requirements into a tangible product that meets all requirements and quality parameters, these customer requirements are crucial. They are used to design and develop the print production project. In order to provide customers with products that meet their needs, it is important that customer requirements are properly understood, interpreted and implemented in the production process. Not only understanding customer requirements, but also the ability to adapt production to those requirements is an important part of successful job fulfilment. The interaction between customer requirements and production capabilities must be ensured by the operational management system. To ensure successful implementation of customer requirements, it is therefore important to have clear coordination between the customer, the order manager and production.

The operational management system for the acceptance of orders includes the processing and analysis of data on the structure of requirements and their information characteristics, which is an important stage in the process of accepting and fulfilling orders. The data on the structure of requirements contains detailed information on the parameters of the products, the quantities, the lead times and any other necessary information on customer requirements. This data is essential for the correct understanding of the nature of the order and for the efficient execution of the order. Data on the information characteristics of requirements is an important resource for the operational management system. It determines the detail, structure and specifications of customer requirements. Collecting, processing and analysing this data in the correct way helps to avoid errors in fulfilling the order, ensures mutual understanding between all parties and helps to manage production to achieve optimum results. Collecting and systematising requirements data, which allows you to create basic information for further analysis, is one of the key aspects of this component. To ensure consistent implementation, avoid conflicts and ensure the quality of the order, systematic data on the structure of the requirements is needed. This information also contributes to the improvement of the efficiency of order fulfilment management and the timely response to changes in customer requirements. Tracking and controlling the updating of information on the structure of customer requirements is an important aspect. Continual im-

provement and updating of this data will enable you to obtain reliable and updated information to respond to customer needs. It also helps to maintain competitiveness and ensure stable development of the company by identifying new requirements and taking them into account in the operational management system.

Important initial data, the most important of which is information on the financial terms of the order, form the basis of the operational management system for order acceptance. This information allows the company to estimate the cost and profitability of producing the order, which is crucial when deciding whether to accept or reject an order. Financial analysis helps companies optimise production processes, plan resources and determine development strategy. Parameters such as production cost, selling price, order volume, lead time, marketing and logistics costs are included in the financial terms of an order. Assessing these factors allows the company to calculate expected costs and potential profits. This helps to make an informed decision about entering into a transaction with a customer. In addition, the analysis of financial conditions is an aid to the identification of potential risks and the safeguarding of the company's financial stability. Systematising and storing information about the financial terms of an order is an important aspect. This simplifies the management and decision-making process by allowing you to record and analyse the financial parameters of each contract separately. In addition, this information can be used in the company's budget planning, in the search for new opportunities to increase profits and in the search for new customers. Analysis of the financial terms and conditions of an order can also lead to optimisation of the company's operational processes. This can include the improvement of production technologies, the establishment of effective inventory management systems and the maximisation of the use of production resources. In this way, the company can ensure optimal conditions for the manufacture of products. This reduces costs and increases profitability. Analysis of the financial terms and conditions of orders also helps the company to forecast the demand for products, to develop pricing and production strategies, and to determine the acceptable level of risk for the business. An operational management system can be an effective tool to support a company's strategic objectives and ensure its successful operation, taking all these aspects into account.

Depending on the situation and purpose, the operational management system for accepting orders is chosen. However, information on the order volume and service parameters is the starting point for any such system. This data is key to the determination of the scope of work and the terms and conditions of the

order. They are important for further planning and execution of the work and are defined in advance by the client or customer. The number of goods or services the client wishes to purchase or receive can be defined as the volume of an order. This can be a numerical value, number of units, volume of services or total amount purchased. Service parameters include the terms and conditions of the order, such as delivery times, warranty conditions, special requirements of the customer, etc. This information will help you to define the scope of the order in detail and to determine the measures necessary for its successful completion. In order to plan resources and production processes, it is important to know the order volume and service parameters. It enables the company to calculate the necessary costs, plan work time and resources, and determine material and equipment requirements. This helps to optimise production processes. It ensures efficient order fulfilment and customer satisfaction. The company's pricing strategy is also influenced by order volumes and service parameters. They enable you to determine production costs, sales prices and order profitability. The analysis of this data helps a company to set competitive prices, to maximise profits and to ensure the sustainable development of the business. Data on order volumes and service parameters can also help a company to record and analyse the efficiency of order fulfilment, identifying opportunities for process improvement, timely response to changes in customer requirements and maintaining high service quality. In general, order volumes and service parameters are important initial data that help the company to successfully manage accepting and fulfilling orders [25].

Information on operational document flow is an important component of successful work with clients in the system of operational management of order acceptance. This workflow contains all the information needed to manage orders and ensure effective interaction with the client at the stage of executing the order [24]. The operational workflow contains data on orders, their status, deadlines, scope of work and other parameters that allow controlling and reporting on each order. This information is useful for the allocation of tasks between company departments, the avoidance of delays and the timely resolution of problems that arise during the execution of an order. Customer interaction information such as contact details, order history, suggestions and customer requirements are also displayed in the operational workflow. At every stage of the work, you can maintain a high level of service and ensure mutual understanding with the customer. By analysing operational workflows, you can identify and resolve potential order handling problems. You can also improve customer interaction processes and

increase customer satisfaction. With this information, you can respond to changes in customer demands in a timely manner. You can adapt strategies to meet customer needs. The operational workflow acts as a reliable tool for the internal control and monitoring of the order acceptance processes. An organisation can manage orders effectively, meet its commitments to customers on time and provide high quality service with a clear structure and accessible information.

This input data is the key to effective order acceptance and fulfilment management. It enables the operational management system to respond accurately to the needs of the customer, to plan production, to monitor financial performance and to ensure a high quality of service. By analysing this data, you can maintain the efficient operation of the system and optimise the order management processes to achieve better results.

CONCLUSIONS

As a result of the study it is possible to make a number of generalisations. *Firstly*, the information structure as a component of the system for ensuring the management of the production of print products based on the system-process approach is an organised system for the collection, processing, storage and distribution of the information necessary for the optimal management of production processes. The aim of this system is to ensure the availability, accuracy and relevance of the information used to make management decisions. The system-process approach involves establishing optimal information exchange procedures to achieve management objectives, taking into account the interrelationships of all elements of the production process.

Secondly, a number of important tasks, from order processing and production documentation to production results control and analysis, can be solved by creating an information structure for company management. Production planning, customer invoicing and production scheduling are also important.

Thirdly, a comprehensive system of information and management components is needed to create and use an information structure to ensure the management of print production based on a system-process approach. These components include information technologies for automating and optimising print production processes, production process management systems and a logistics process management system.

Fourthly, the development of print production through the use of information technology and automated management systems makes it possible to optimise the processes of interaction between customers and producers. This improves decision-making and the quality of service. The hierarchical structure of automated management systems for print production allows

each substructure to perform its tasks efficiently. The distribution of responsibilities and resources between different levels helps to optimise business processes.

Fifthly, the proper collection and management of information is of great importance in the operational management system of print production order acceptance. The key to successful order acceptance and fulfilment is initial data, including customer requirements, requirement structure, financial conditions, order volume and operational workflow. You can interact effectively with customers, understand their needs and requirements, and assess the profitability and production costs of each order using the information base supported by this data. Operational management based on this data allows you to respond quickly to changes in customer requirements, optimise production processes and ensure that orders are fulfilled on time. It is important that all departments and employees involved in the production of print products have access to up-to-date data, systematic updates, and timely information. For the successful operation of a printing company, the operational management system of order acceptance is therefore crucial.

Therefore, maintaining the interaction between all elements of the production process and ensuring its optimal operation is achieved by applying a system-process approach to production management. Improving product quality, reducing costs and increasing the competitiveness of the company is achieved by implementing the information structure. Thus, for the effective functioning of print production in today's market, it is important to improve the management system and create an information structure. ■

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ВПЛИВ ЦИФРОВИХ ТРАНСФОРМАЦІЙ НА РОЗВИТОК СУЧАСНОГО ЕКОНОМІЧНОГО ПРОСТОРУ: ЛЮДСЬКИЙ КАПІТАЛ, ІНКЛЮЗІЯ, БЕЗПЕКА

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Птащенко О. В., Кириленко О. П., Курцев О. Ю. Вплив цифрових трансформацій на розвиток сучасного економічного простору: людський капітал, інклюзія, безпека

Цифрові трансформації, що охоплюють інтеграцію новітніх технологій у всі аспекти життя, кардинально змінюють сучасний економічний простір. Цей процес має глибокий вплив на три ключові аспекти: людський капітал, інклюзію та безпеку. Зазначені фактори взаємодіють у контексті цифрових змін, оскільки їхнє правильне управління є критично важливим для стійкого та справедливого економічного розвитку. Саме тому метою представленої роботи є визначення впливу цифрових трансформацій на розвиток сучасного економічного простору в аспектах інклюзивності, безпековості та розвитку людського капіталу. Основними методами, представленими в дослідженні, є: метод аналізу, метод синтезу, метод узагальнення, логічний метод, метод експертного оцінювання, метод дедукції, метод індукції, табличний метод, графічний метод. До основних результатів дослідження можна віднести висновок про те, що цифрові технології створюють нові вимоги до навичок і знань. Сучасні бізнес-моделі вимагають висококваліфікованих фахівців, здатних працювати з великими даними, штучним інтелектом, кібербезпекою та іншими передовими технологіями. Це вимагає значних змін в освіті та професійній підготовці, а також постійного навчання та перекваліфікації працівників. Також цифрові трансформації можуть поглибити соціальну й економічну нерівність, якщо не забезпечити рівний доступ до нових технологій. Різні верстви населення можуть мати нерівний доступ до цифрових ресурсів і можливостей, що може призвести до виключення певних груп із економічної активності. Цифрові трансформації супроводжуються збільшенням кіберзагроз, таких як хакерські атаки, крадіжки особистих даних і шахрайство. Зазначене може ставити під загрозу безпеку особистих даних, бізнес-процесів і національної безпеки. Таким чином, цифрові трансформації мають потужний вплив на розвиток сучасного економічного простору, змінюючи динаміку людського капіталу, питання інклюзії та аспекти безпеки. Для того, щоб максимізувати позитивні результати від цифрових змін і мінімізувати можливі негативні наслідки,