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DESIGNING OF MULTILEVEL SYSTEM THE DISTRIBUTED RESOURCES ADMINISTRATION IN POLYGRAPHICALLY ORIENTED NETWORK INFRASTRUCTURE

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Advantages of innovative progress of polygraphy machine industry in the context of modern directions of rendering of printing services are analyzed. The importance of development of establishments of operative polygraphy with publication of limited edition and individual approach to customer according to the existing market situation is substantiated.

The review of home and world trends in transformation of printing industry and organization of production showed the lack of production facilities for flexible order support throughout the life cycle and imperfect functionality of information flows profiling in run of completed out a work tasks. Research methodological basis are principles of design theory and simulation modeling, focused in accordance with the formulated criteria on attributes determination of extended work task and flows profiling of personalized data in according to stipulated entities of technological process.

The scientific novelty of the obtained results is to develop an original infological model of target structuring in data hierarchy on work tasks for different stages order preparation with accompanying visualization of profiled content. Obtained research results will allow to expand the industry format for the exchange of production data, at the same time ensuring close integration with existing systems of through management of printing production and their gradual unification. The presented infological model will provide the deployment of a multilevel administration system of distributed resources of polygraphically oriented network infrastructure based on the software engine to support the formation of workflows and corporate record keeping in enterprise management.

Keywords: *operative polygraphy, network infrastructure, printing services providing, technological process.*

Formulation of the problem. Innovative development of printing industry together with a specialization in computer technology opened a variety of polygraphy services, while expanding the nomenclature and reducing the minimum volume of private orders down to singled copies. Remained in the past a difficulties of preparing for printing of form, advertising, souvenir and packaging products of limited edition, caused by the high cost, complexity and time consuming execution of such orders, including manually adjusting the equipment to parameters of current work task.

In addition to printing processes, pre-printing technologies are also rapidly evolving, which today mostly boil down to customer's layout original processing, page positioning, and final color separation of polygraphy order. The efficiency of post-print order processing, further distribution and delivery of finished products also favorably differentiate small and medium-sized printing establishments from their classical competitors. The incompleteness of described scheme of the production task passage makes the refinement of modern business processes of enterprises of operative printing, imposes specific requirements on hardware and software, network infrastructure, communication web resources and strategic management according to the current market situation, as well as domestic and global trends in the provision of polygraphy services.

Analysis of recent research and publications. To issue of printing industry development and production organization, in particular, digital printing establishments, control of equipment and quality of manufactured products in manufacture of individual orders are devoted to the research of number of scientists. Computerization of logistics the limited edition with the construction of a commercial print model and targeted publications is highlighted in [1], promising technologies for the implementation of equipment and functional materials are shown in [2]. In [3-5] are presented the typical scenarios on applying a production paradigm for improving competitiveness and modeling the dynamics of production system efficiency. The integrated concept of production systems with representation of separate technological stages as a single holistic system is developed in [6-8].

However, in domestic and foreign open sources are not fully described the characteristics of production means, that would accompany orders throughout in lifecycle from author's concept clarification and inquiry registration and concluded a targeted delivery of the finished product. The performed analysis (table 1.) by stipulated criteria [9] showed that the available service supply environments of technological stages the operational printing as native applications – focused on reconciling printing equipment interfaces, and as web services – maintain a limited dialogue with the customers. Therefore, partially or completely is absent here telemetry processing functionality and profile information flows during the development of the production task, mechanisms for detecting the accumulation of disparate orders at a certain technological stage, tracking insufficient raw materials and supplies, generation of technological map for adjustment of equipment to other production, search engine optimization for web resources.

For other processes of firm, including business records, accounting, corporate budget planning, and more the problem is the harmonization of interoperable structures of information flows and crossplatform interaction protocols, which causes the use of additional converters and as a result of the accumulation of cumbersome software in enterprise with inefficient duplication of feasibled services and compulsory human factor, which performs algorithmically implemented operations and presents unforeseen risks.

Table 1.

Functional eventualities the widespread computerized support environments for operative polygraphy systems

	CATEGORIES / ENVIRONMENTS	ORGANIZATION			LOCALIZATION			DISTRIBUTED MODE			ORDER CONSTRUCTOR			TASK PROCESSING			REPORTS GENERATION			AUTOMATIZATION OF TASKS		
		license accessibility	code openness	IDE prevalence	interface	documentation	Cyrillic support	network administration	working with databases	client-server architecture	virtual office	choice of raw	calculator	workflows profileding	stage visualization	choosing of optimal technological map	processes log	phased cost estimation	production telemetry	typical orders	equipment readjustment	search engine optimization
NATIVE APPLICATIONS	CZ Print Job Tracker	–	–	+	–	–	–	+	+	–	–	–	+	–	–	–	+	–	–	–	–	*
	Print Polish Marker	+	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*
	ExclliPrint	–	–	–	–	–	+	–	–	–	–	–	–	–	+	–	+	–	–	–	–	*
	Remote Queue Manager	–	–	+	–	–	–	+	+	+	–	–	–	–	–	–	–	–	–	–	–	*
	Print Manager Plus	–	–	+	–	–	+	+	–	–	–	–	+	–	–	–	+	–	–	–	–	*
	Print Relise Station	–	–	–	–	–	–	+	+	+	–	–	+	–	+	–	+	–	–	–	–	*
	System Print Manager	–	–	*	+	+	+	–	–	–	*	–	–	–	–	–	–	–	–	–	–	*
	Remote Print Manager	–	–	–	–	–	–	+	+	–	–	–	–	–	–	–	+	–	–	–	–	*
WEB SERVICES	festprint.com.ua	*	+	+	+	–	+	–	–	–	+	+	+	–	–	–	–	–	–	–	–	–
	dpi.ua	*	+	+	+	–	+	–	–	–	+	+	+	–	–	–	–	–	–	–	–	–
	drukuy.com.ua	*	+	+	+	+	–	–	–	–	+	+	+	–	–	–	–	–	–	–	–	–
	wolf.ua	*	+	+	+	+	+	–	–	–	+	+	+	–	–	–	–	+	–	+	–	–
	albom.com.ua/	*	+	+	+	–	+	–	–	–	+	–	+	–	–	–	–	–	–	–	–	–
	latona.lviv.ua	*	+	+	+	+	+	–	–	–	+	+	+	–	–	–	–	–	–	+	–	–
	psdruk.com.ua	*	+	+	+	–	–	–	–	–	+	–	+	–	–	–	–	–	–	–	–	–
	www.sprint.rv.ua	*	+	+	+	–	–	–	–	–	+	–	+	–	–	–	–	–	–	–	–	–

* criterion cannot be applied to deployment environment

The purpose of the article — localization of basic stages of qualitative and prompt of individual order fulfilment and the further deployment of unified distributed polygraphic services administering system with integrated flexible mechanism of redistribution of server load of the main nodes to dynamically tracking the production task performance degree together with monitoring the status of individual toolkit means and interactive accompanying visualization of profiled content at end-user terminal of operational polygraphy network infrastructure.

Presentation of the main research material. The organization of network infrastructure of the publishing and printing corporation should be carried out in view of peculiarities of its administration. In this case the overriding difficulty lies in reconciling the information flows of disparate computerized platforms, active networking equipment, service and application software (Fig. 1). In designed polygraphically oriented network infrastructure one of *artworker* end-terminals receives a inquiry ЗТ from *customer* registered in the database. This inquiry can be a ready-made file or a set of customer desires in view of enterprise services list on corporate web portal, for what a file is prepared in one of the data structures of respective publishing system component [10]. Next is the color correction, the location of markup and control scales, trapping arrangement, layouting in accordance with paper format together with circulation amplification, other stages of the necessary printing preparation.

Thus, after adjusting the query on an automated workplace with a specific operating system and desktop publishing application software suite, an order ЗМ is registered for the relevant entity from the customer date base. The data structure of this order contains a direct link to corrected file, and also covers details of customer's desires regarding a quality, specified circulation, material of media, consumables, terms of preparation of finished printing product and its delivery, etc. The prepared order is interpreted on *print server* in commands list of target equipment driver – a prints work task ЗН, which is also stored in production order database, separately allocated for this purpose.

Therefore, itself the work task contains a PostScript description of the polygraphic product in terms of printing device profile and possible post-print processing and shipping information. The work task arrives at target equipment, which, under the supervision and involvement of *operator*, directly manufactures the production. Printered order can be delivered to other accessories, such as folding, then gluing, trimming, laminating, etc. and at all composition stages, the task ЗН is expanded and refined to include details of the resources involved, raw materials, supplies and specifications of the current process with automatic report ЗВ generation about work done.

Based on this generalized customer order lifecycle report the analytical apparatus of presented information system for managing the institution of operative printing generates profiled reports for conditioned entities of polygraphically oriented network infrastructure in the form of process monitoring, management reporting, financial records, accounting, asf. So, entity *supervisor* (Fig. 1) is able to observe in real time the change in telemetry of sensors and actuators. The entity *engineer-technologist* inspects production outturn of equipment involved, list of orders in queue,

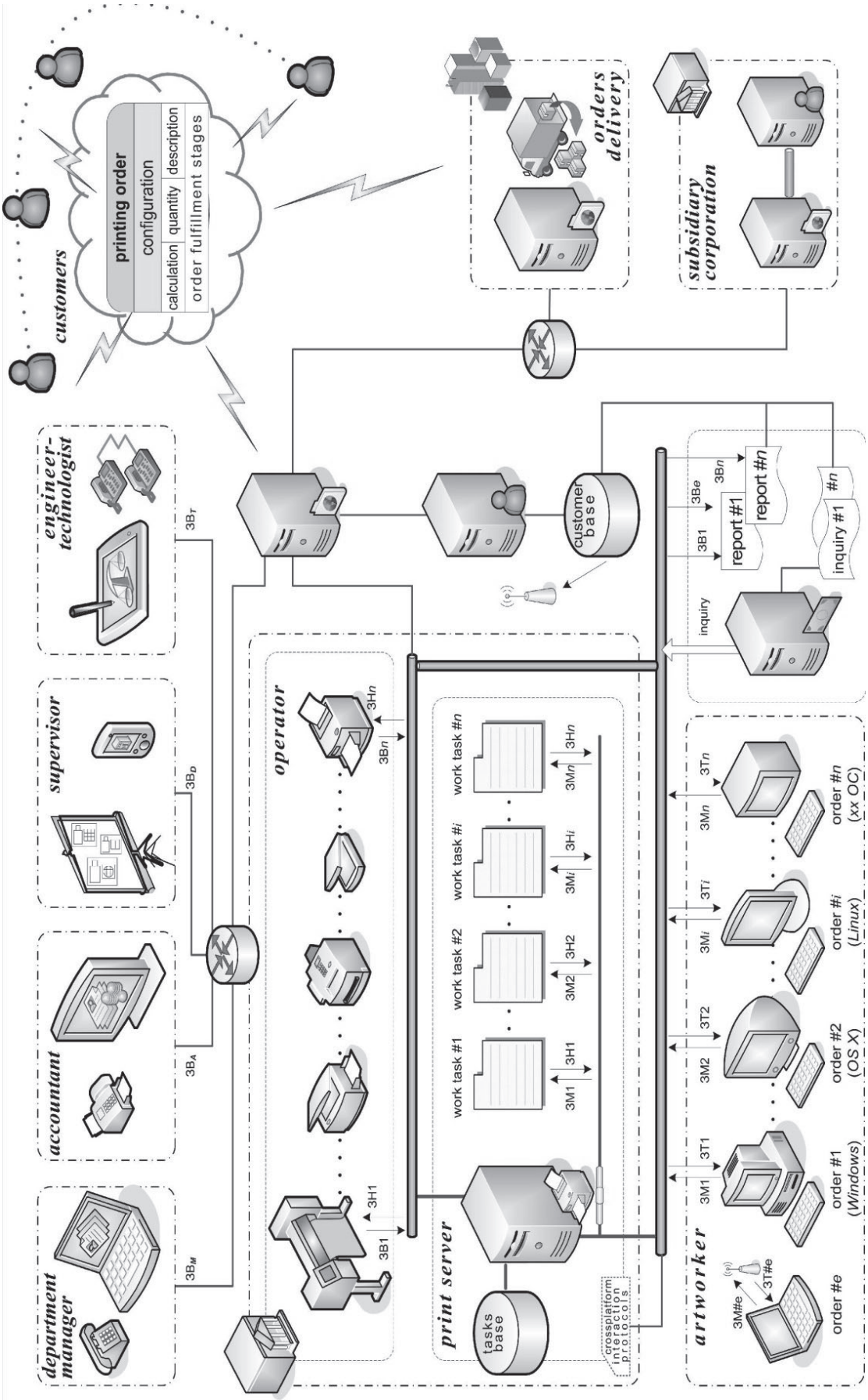

Fig. 1. Profiling information flows in the preparation of polygraphic production

nomenclature of raw materials and consumables necessary for organization of technological process and interactive make the needed adjustments. Profiled information on the value of material, physical and intellectual resources, those were spent on each order in accordance with production standards and including depreciation of hardware and software, arrive at end-terminal of entity *accountant*. Indexed reporting of described entities with some confidential production information is provided to entity *department manager*.

Attached to work task such structured extended report for all target equipment for pre-print, print and post-print order processing together with the individual contribution of all the specified entities it is decided to keep an separate original hypertag [11] in the structure of JDF production format [12], that will ensure close integration with existing systems of through management of polygraphical production and their gradual unification. The hierarchy of such a hypertag fully covers production tasks for the various stages of order preparation, acting as algorithmic support of software engine the designed system that forms workflows, transmits the attributes of the manufacturing equipment setting and maintains documentation and financial reporting in enterprise management process.

Conclusions. Deployment of projected multilevel system of administration of distributed resources of polygraphically oriented network infrastructure will provide a unified control of the life cycle of order execution in all categories of production processes from registration to delivery with the accompanying visualization of profiled content at end-terminal of communication web resources of enterprise of the printing industry regardless of the data display device and its location. Also it allows one to avoid the accumulation of disparate orders in one device or stage due to inconsistency of information flows, ensuring that work task is automatically re-routed to the optimal or free area, and inform in a timely manner about the completion of relevant consumables or means of production.

Further development of the project will be in the direction of expanding the client functionality of the dynamic web portal, which will facilitate the automation of production tasks, and the refinement of corporate database according to the stipulated attributes of technological stages. Due attention also should also be paid to formalizing the criteria of a fuzzy artificial neural network algorithm [13] to analyze and harmonize the main aspects of management activities and making decisions to coordinate the totality of equipment and communications between them, reducing the number of administrative and technical services and realizing unimpeded and high-quality preparation of printing order while reducing the complexity of production process.

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ПРОЕКТУВАННЯ БАГАТОРІВНЕВОЇ СИСТЕМИ АДМІНІСТРУВАННЯ РОЗПОДІЛЕНИХ РЕСУРСІВ ПОЛІГРАФІЧНО ОРІЄНТОВАНОЇ МЕРЕЖЕВОЇ ІНФРАСТРУКТУРИ

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Проаналізовано переваги інноваційного поступу поліграфічного машинобудування в контексті сучасних напрямків надання поліграфічних послуг. Обґрунтовано важливість розвитку закладів оперативної поліграфії з випуском обмежених накладів та індивідуальною роботою з замовником відповідно до наявної ринкової ситуації.

Виконано огляд вітчизняних та світових тенденцій трансформації поліграфічної галузі й організації виробництва, який показав відсутність засобів ведення виробництва для супроводу замовлення впродовж усього життєвого циклу та недосконалий функціонал профілювання інформаційних потоків у ході відпрацювання виробничого завдання. Методологічну базу дослідження становлять принципи теорії проектування та імітаційного моделювання, зосереджені відповідно до сформульованих критеріїв на визначенні атрибутів

розширеного виробничого завдання і профілюванні потоків персоніфікованих даних згідно з обумовленими сутностями технологічного процесу.

Наукова новизна одержаних результатів полягає у розробленні оригінальної інфологічної моделі цільового структурування ієрархії даних по виробничих завданнях для різних стадій підготовки замовлення із супровідною візуалізацією профільованого контенту. Результати виконаних досліджень дозволять розширити галузевий формат обміну виробничими даними, забезпечивши тісну інтеграцію з існуючими системами наскрізного управління поліграфічним виробництвом та поступову їх уніфікацію. Наведена інфологічна модель забезпечить розгортання багаторівневої системи адміністрування розподілених ресурсів поліграфічно орієнтованої мережевої інфраструктури на основі програмного рушія підтримки формування робочих потоків та корпоративного діловодства у процесі управління підприємством.

Ключові слова: *оперативна поліграфія, мережева інфраструктура, надання поліграфічних послуг, технологічний процес.*

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