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## How Printing Industry Meets Technological and Financial Challenges

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# How Printing Industry Meets Technological and Financial Challenges

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**Abstract.** Printing and publishing industry is currently undergoing a period of transformation caused by powerful technological shifts, leading to a change in the business model of the industry. Instead of being a producing industry, printing is becoming a part of the service industry. The economic situation in the printing industry is difficult. The consequences of competition from digital technologies are a decrease in investment, profit and sales and an increase in operating costs. The changes could not but affect the structure of the industry, its financial performance, the activities of individual companies and their financial situation. Sustainability of the industry was in jeopardy, which requires analysis and development of measures to ensure the successful adaptation of printing companies to changing business conditions. The purpose of this research is to identify opportunities and threats for printing companies based on investigation organizational and technological trends in the industry and the financial performance of companies. Object of study is constituted by the printing companies of St. Petersburg. Methods of financial and economic analysis and statistical techniques are used. The made as the result of study may be useful for the heads of particular companies and for the governmental bodies responsible for industrial policy..

**Keywords:** Printing Industry, Printing Technologies, Industrial Organization, Financial Performance, Opportunities and Threats.

## Introduction

Among manufacturing industries, the printing industry ranks 5th in the world by the volume of production, but it rarely attracts the attention of researchers. The printing industry has a large economic footprint in the global economy [1]. In any economy it serves the variety of many areas, including government, finance, education, and produces a wide range of products used at all stages of each business and in everyday life of each person - newspapers, magazines, books, postcards, letterheads, etc. Consumers of printing products are large companies and the smallest firms, individuals with different activities and interests. The printing method is also applied to apply images to fabric products and other surfaces. In addition to direct contribution, there are numerous ways of indirect affecting of the printing industry on the economy.

For example, the packaging and advertising industries are heavily dependent on the printing industry. The variety of consumers predetermines the variety of products and requirements to their features. And the structure of printing industry reflects the diversity of its products and determines the fragmented nature of its market.

Printing is a technology-oriented industry. In the prepress, printing and post-printing processes, complex and high-precision equipment and specialists with the highest professional

qualifications are required. Currently, the printing industry is undergoing fundamental changes in all aspects of its activity, a high level of technological progress is observed all over the world, and there is no doubt that the results of the recent research, modern technical and technological achievements and trends make a huge contribution to the printing industry development. According to Thompson [2; 3], the current economic climate, wide coverage and high speed of creating new technologies guarantee that the future of the printing industry will not be simple, but there are great opportunities for the industry to increase productivity and efficiency.

The main challenges faced by the printing industry are associated with the new technologies. Firstly, the spread of the Internet as a source of operational information caused a decrease in demand for information print production (newspapers, magazines), and the availability of materials on digital media contributed to a decrease in the need for books. Secondly, the spread and rapid improvement of digital printing devices not only created competition for printing companies in the operational execution of small volumes of work, allowing many potential customers to perform work independently or with the help of newly emerging small firms, but also forced printing companies to upgrade their production base and accelerated mastering of new equipment.

Increased market competition and a growing variety of consumer requirements increase the industry's dependence on demand and necessitate the consideration of individual requirements in the printed products, thereby reorienting the industry from manufacturing to providing services [4]. Thus, the value created by the printing industry can lie not only and not so much in the material product being manufactured, but also in the characteristics of the manufacturing process and the compliance not only of the material result, but also of the process with the specific customer's requirements. Growing customer dependence and a shift from manufacturing to services are changing the requirements for technologies used in the industry, increasing the importance of such characteristics as speed, flexibility, and mobility.

According to [5], not all printing companies are able to succeed in new situation: approximately 20% of companies will be able to form a diversified service portfolio and ensure profit growth, about 60% will stagnate with a reduction in profit, and the remaining 20% will experience rapid decline in sales and profits. The medium 60% of companies have a hypothetical opportunity to offer new services to the market, but this requires a fundamental rethinking of the business [5].

Shah [6] supposes that the promising opportunities that are currently opening up for the printing industry are largely associated with the use of innovative digital technologies - cloud technology, the Internet of things, artificial intelligence.

## Data and Methods

The study is based on theoretical provisions formulated in modern scientific works and focused on the adaptation of the printing industry to technological and economic challenges.

The object of the study is printing companies of St. Petersburg, differing in size and financial result (Table 1). Financial and economic data on the companies' activities were obtained from the SPARK database (Interfax). The study included companies for which at the time of accessing the database, the information for 2017 and 2018 was available.

Table 1. Sample description.

Group of companies	2017				2018			
	Total	Profitable	Break-even	Unprofitable	Total	Profitable	Break-even	Unprofitable

Large	3	2	0	1	3	2	0	1
Medium-sized	6	5	0	1	5	5	0	
Small	22	21	0	1	24	21	0	3
Micro	703	575	4	124	715	591	2	122

Due to the fact that the number and composition of enterprises in the samples of 2017 and 2018 do not completely coincide, the analysis was based on the conditional companies. The balance sheet figures and the figures of the income statement of the conditional companies are the arithmetic mean values of the corresponding indicators for the groups of companies. The companies were separated by size and profitability level. This approach allows aggregate characterizing the state of the industry. Methods of financial and economic analysis and statistical techniques are used. For groups of profitable and unprofitable companies, an analysis of the indicators described in Table 2 was conducted: To analyze the survival of companies the diagrams of distribution density were built.

Table 2. Analyzed financial indicators.

Designation and calculation method	Description
K1 = Equity/ Assets	Characterizes financial independency and sustainability
K2 = Long term liabilities/ Assets	Jointly with K1, characterizes financial sustainability in short term period and indirectly reflects the creditors' trust
K3 = Fixed Assets/ Assets	Characterizes the capital base of production process
K4 = Money and Equivalents/ Current liabilities	Characterizes instant liquidity and the ability to pay off the current liabilities
K5 = Current assets / Current liabilities	Characterizes liquidity and the ability to pay off the current liabilities
K6 = Gross Profit/ Costs	Characterizes productivity of the costs
K7 = Gross Profit/ Assets	Characterizes productivity of the assets
K9 = Net Profit/ Equity	Characterizes the financial result from the <u>owners' standpoint</u>

## Main Provisions and Results

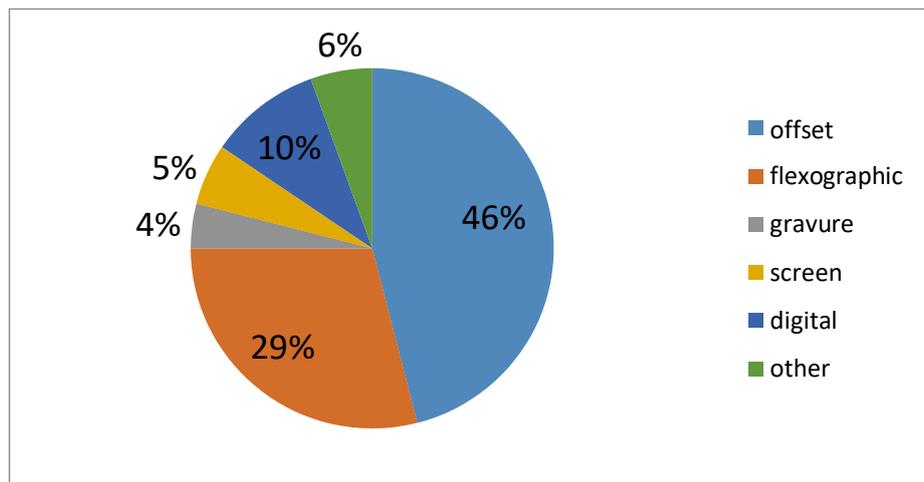
### State of the Printing Industry in Russia

As indicated in [9], printing is not among the priority areas for the Russian economy development, but it retains its significance in the common economic space. In [9] it is also said that the printing industry receives constant support from the state, and the further improvement

of printing industry is today determined by the information and digital technologies development. The current situation in printing, the need to work out measures for its further development, as well as assessing future changes in the printing market, makes it necessary to take into account, first of all, the current and possible changes in the media consumption and prospects in the industrial printing segment.

According to the Federal State Statistics Service, the output of the printing industry in 2018 increased by 16.2% compared with 2017 and amounted to almost 300 billion rubles in comparable prices. Skopintseva [10] associates the growth with the following factors: 1) changes in industrial statistics; 2) adaptation of enterprises to new situation; 3) development of a new direction - an effective business model for small-scale printing.

In recent years, the total volume of printing production in Russia has remained almost unchanged, but there are noticeable changes within the industry. Offset printing volumes are gradually decreasing. Flexographic and gravure printing volumes are growing, although the growth rate is declining. The share of digital printing is growing steadily from year to year, and although its total volume is still small, it is the most rapidly growing segment in the printing industry. The industry structure in terms of printing technologies is shown in Fig. 1.



**Fig. 1.** Structure of the printing industry in terms of printing technology.

Digital technologies prevail in advertising and commercial printing, where their share is about 30%, while digital technologies account for no more than 6% in packaging design, label printing and publishing printing [11]. Digital printing technologies have advantages when printing small runs, the need for personalizing printed products, improving print quality and productivity. Circulations of printed products are currently being reduced, but the market for small-run products with the short term of production has significant chance for growth. Small circulations, circulations requiring urgent printing or personalization are switching to digital printing [12]. Zhavoronkova and Tsepkova [13] see the reason for the slow development of digital technologies in the high price of the print and also come to the conclusion that at present, digital printing is economically justified only for small-run orders.

The change in the industry's technological structure was a natural consequence of a change in demand for printing work, the introduction of digital technologies and software solutions in domestic printing houses, the use of the latest generation technological equipment and production automation. The orders receiving and processing reorganization based on computer

technology, as well as the possibility of online access, contributes to the development of the digital business line.

The following is identified as the main factors that have a negative impact on the stability of the printing industry [14]:

- on the part of consumers - reducing orders, deferring payment, claiming for lower price of printing works and services, making changes to the order lists;
- on the part of suppliers - toughening the terms of delivery and payment, in particular, increasing the requirements for prepayment, disruption of supply, increasing prices for goods and services;
- on the part of banks — raising interest rates on loans, complicating procedures and conditions for granting loans.

As indicated in [15], the specificity of the printing companies' technical base lies in the fact that it focuses on a specific product and its parameters. Because of this, the industry's reaction to market changes in related fields, for example, the publishing, is not always operational, and, on the contrary, related industries may not be able to respond to new printing opportunities quickly. The traditionally tight relationship between printing companies and publishers is complicated by the price factor also.

It should be noted that in Russia the production of not only printing and finishing equipment and machines, but the majority of printing supplies has not been established. As a result, the development of the printing remains dependent on import.

Seifullaeva, Murtuzalieva, Tverdokhlebova, Burakova & Pogorilyak [16] offer 3 scenarios for the companies' development in printing industry of Russia until 2020:

1: Efficient print production that benefits content providers and readers. This scenario assumes development by maximizing the efficiency of the value chain, increasing production flexibility and adapting to various formats and materials.

2: Adding value to the printed product by giving it new properties increasing its attractiveness. This scenario involves the development of the industry through the products, which are independent interactive media that will be aimed at multi-sensory perception and interact freely with other media.

3: Producing non-media products by printing methods. This scenario involves the development by expanding the production of non-media products in the form of separate or integrated products and components.

## **Financial Situation of the Printing Companies in Saint-Petersburg**

The printing industry of St. Petersburg is represented by companies of various sizes. Most enterprises are privately owned by residents, a number of enterprises represent foreign ownership or were created with the participation of foreign capital.

Sustainability of company's development is determined by the implementation of the so-called "golden rule", according to which the relative increase in net profit should be higher than the increase in gross profit, which should exceed the increase in revenue. The latter, in turn, should exceed the increase in assets.

The ratio of the mentioned indicators' relative growth in 2018 compared to the previous year is shown in the Table. 3. It may be seen that the growth of assets is accompanied by the outstripping growth of revenue only in the small companies' group, however the change in their gross profit is negative. Large and medium-sized companies have a gross profit growth greater than revenue growth. Large, small and micro enterprises have a negative growth in net profit.

The positive value of this indicator for medium-sized companies is explained by the absence of unprofitable companies in the sample for 2018.

The table 4 shows the growth rates of indicators included in the golden rule for profit-able companies of different size. A significant increase in the assets of profitable large companies is accompanied by a significantly smaller decrease in relative net profit than in the group as a whole. It should also be noted that profitable microenterprises comply with the golden rule regarding the correspondence of revenue, gross profit and net profit growth, and this is the only group where all growth indicators are positive.

Table 3. Gold rule of business for mean company.

Group	Change, %			
	Assets	Revenue	Gross profit	Net profit
Large	2.1	11.2	23.7	-234.9
Medium-sized	106.4	32.5	36.5	32.2
Small	12.6	16.1	-27.1	-13.0
Micro	56.6	8.3	0.7	-14.0

Table 4. Gold rule of business for mean profit-making company.

Group	Change, %			
	Assets	Revenue	Gross profit	Net profit
Large	43.6	12.1	-2.3	-28.4
Medium-sized	73.1	30.9	13.8	-14.1
Small	8.9	18.2	-27.6	-13.5
Micro	32.2	7.2	19.5	19.9

Among large companies, the federal company Goznak stands out. In addition to printing, the company also produces paper. Its assets in 2017 exceeded the assets of the next company about 44 times, and in 2018 the excess was more than 30 times. Due to obvious incomparability, this company was excluded from consideration.

In addition to Goznak, in the analyzed period there were 3 large companies that were analyzed. A small number of companies can't provide representativeness of group averaging. The Table 5 shows that in 2017, a loss-making company had the indicators K7, K8 and K9, characterizing the performance, less than that of the mean profitable company. In 2018, the major losses incurred by CONFLEX SPB exceeded the profit earned by the other two companies. However, the indicators of K7 and K8 of the loss-making company significantly exceeded the similar mean figures of profit-able companies.

The number of medium-sized companies is also small. The only one which finished with a loss in 2017, of the 6 companies did not get to the sample of the next year. The remaining 5 companies were profitable in 2018. However, their productivity indicators K7, K8 and K9 decreased significantly. Indicators K2 and K3, reflecting an increase in dependence on short-term debt, decreased significantly, and indicator K6 showed a slowdown in the turnover rate.

The averaged small business in 2018 showed lower values of K7 and K8 than in 2017, but at the same time, the value of K9 increased slightly, which can be considered as a result of improved financial performance of companies.

Table 5. Financial indicator of the groups of companies.

Group	Year	K1, %	K2, %	K3, %	K4	K5	K6	K7, %	K8, %	K9, %
Large Profitable	2017	7.3	26.9	31.1	0.02	1.95	1.80	13.2	21.0	11.5
	2018	27.0	35.8	2.3	0.01	1.06	1.40	11.3	14.3	4.3
Large Unprofitable	2017	41.0	37.5	38.5	0.14	2.37	0.99	10.7	9.5	-0.6
	2018	15.2	11.7	1.6	0.00	0.98	1.89	19.5	30.9	-98.2
Medium-sized Profitable	2017	12.6	22.0	19.5	0.0	1.4	2.4	27.6	51.5	38.9
	2018	6.6	16.4	3.0	0.0	1.1	1.8	23.2	33.8	25.9
Medium-sized Unprofitable	2017	0.0	-164.3	0.0	0.1	0.4	65.4	0.0	0.0	*
	2018									
Small Profitable	2017	28.4	29.7	7.6	0.07	1.14	2.02	19.1	32.3	27.0
	2018	26.2	23.0	10.6	0.05	1.11	2.19	10.9	21.5	27.7
Small Unprofitable	2017	19.9	23.9	16.2	0.08	1.06	1.21	6.8	7.7	-34.0
	2018	38.9	60.2	6.8	0.18	1.62	1.24	8.4	9.6	-3.1
Micro Profitable	2017	15.6	40.3	4.5	0.21	1.49	1.96	8.2	14.2	29.2
	2018	12.9	28.5	21.2	0.32	1.50	1.59	9.3	12.8	37.4
Micro Unprofitable	2017	21.6	-14.3	15.6	0.09	0.75	1.76	24.9	36.7	*
	2018	40.8	17.5	30.3	0.04	1.02	0.59	8.7	4.9	-75.9

\*the indicator is not informative due to negative value of equity

Opposite trends had place for profitable and unprofitable small companies in terms of indicators K1 and K2: with a slight decrease for the former and significant increase for the latter. It should be noted that in 2018, the liquidity level of loss-making companies - indicators K4 and K5 - exceeded the level of similar indicators of profitable companies. The K6 turnover ratio of loss-making companies was significantly lower than that of profitable ones.

In 2018, in the microenterprise group, profitable companies had liquidity indicators (K4, K5), as well as turnover (K6) and productivity (K7, K8) significantly higher than of unprofitable ones. It should be noted that, compared with 2017, profitable microenterprises significantly increased the efficiency of equity (K9).

Large and medium-sized companies operate within production business model, leaving the opportunity to supplement it with the services. The large companies profitable in 2018 were 16.5, 18 and 23 years old, the company that existed on the market for 19 years turned out to be unprofitable. Among medium-sized companies, only one can be called a beginner - 3 years old, the rest work in the market from 12 to 21 years. Small companies and microenterprises operate within service business model, and specialize in printing services and carrying out activities on customer orders. The age composition of small businesses is shown in Fig. 2. The unprofitable companies were of different ages - 3, 9 and 12 years.

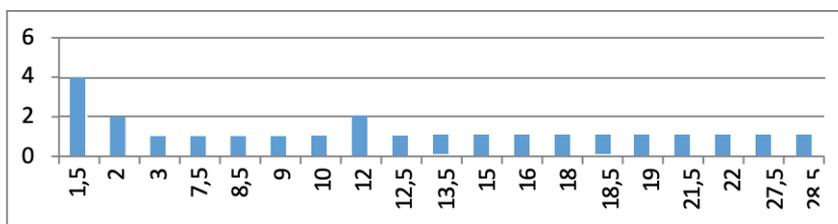


Fig. 2. Distribution of operating small companies by age in 2018.

The most interesting situation is in the microenterprise group, where the share of un-profitable companies is about 17%. Fig. 3 shows the distribution of microenterprises by age in 2018. It can be seen that most micro-enterprises are present in the market for less than 10 years, that is, despite the difficult situation in the industry,, the enter- ing as a printing service provider remains attractive.

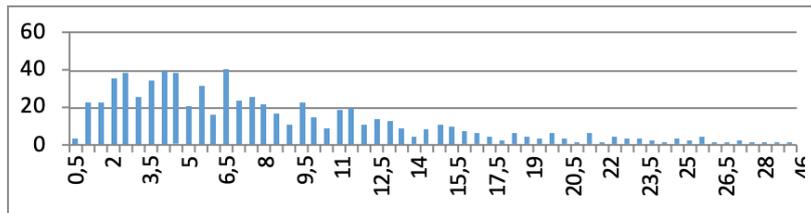


Fig. 3. Distribution of operating microenterprises by age in 2018.

Note that the accumulated experience does not become a guarantee of success. Companies of different ages are present among the unprofitable microenterprises, and the majority is constituted of companies that have passed the 5-year line (Fig. 4).

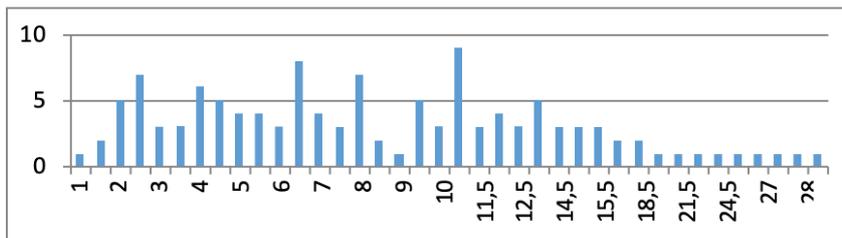


Fig. 3. Distribution of unprofitable microenterprises by age in 2018.

## Conclusions

The development of the printing industry and the printing market depends on factors determining the general trends of contemporary society development. The industry is changing, adapting to the new needs of society. Under these conditions, the main success factor in the market is the company's ability to maintain close contact with consumers.

The emergence of new sources and means of information disseminating has become the main cause of the crisis in the printing industry. Opinions regarding the ways to overcome the crisis and the onset of stabilization differ. The crisis prompted the industry to adopt a new business model. Adoption of the services business model in the printing industry may be considered as a partial, and in the future, possibly full alternative to the traditional production business model. The service business model is based primarily on digital technology which opens up new opportunities for the industry.

In Russian printing, a gradual change in the technological structure of the industry is taking place. The process is complicated by a number of internal and external factors. Three strategic directions of changes aimed at strengthening position of the printing industry were developed.

Analysis of printing companies in St. Petersburg showed that the business models used vary depending on the companies size . Large and medium-sized companies are characterized by a production business model, while small companies and microenterprises operate on the basis of a service business model.

A group of large companies (excluding the largest federal company) in total in 2018 was unprofitable, and the source of losses was not the production but the financial activities of the company. This may be due to the ongoing process of property redistribution. The group of medium-sized companies after the only unprofitable company's leaving became the most successful in terms of return on equity.

For all groups of companies, the rule of outrunning growth is not kept up. All groups of companies experienced significant growth in assets. The only that showed an increase in return on equity in 2018 was the microenterprises group. However, the source of growth was not production, but additional activity.

The age of the companies has no obvious relation to the success of their work. The printing industry remains attractive for new small companies and microenterprises to enter.

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