



EVALUATION OF THE TECHNOLOGY LEVEL OF SMALL AND MEDIUM SIZED PRINTING COMPANIES

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Abstract:

Demands of the modern communication market are increasing constantly. As the economic situation have changed enterprises in print industry have had to completely adapt to market demands while having had faced to a series of challenges. Customers are expecting immediate response, flexibility, maximum expertise and quality, but the constantly growing expenses can not be covered by increasing the price of the product. The tight competition forces companies to optimally use their resources. Market orientation influences the internal processes of the company as well. Optimization of the workflow is a way to improve manufacturing. In most of the Hungarian small and medium enterprises production control does not keep up to technological development. Computer Integrated Manufacturing (CIM) or “networking” as used in print industry, the manufacturing approach of using computers to control machinery in a network, has the potential to improve the entire production process.

The aim of this study is to explore and evaluate the extent to which networking (CIM) is implemented in Hungarian print industry. We evaluated the technical and technological level of the network-integrated manufacturing process of six small and medium printing houses and performed the economic analysis of the integration project of a printing company.

Keywords:

process optimization, workflow, networking

1 INTRODUCTION

The process of making printed media products has substantially changed in the past few decades: it has in fact turned into industrial production from handicraft. In the middle of the 1990s, the fast-paced development of computerized networks, the appearance of the Internet and digital printing technologies have altered the structure of traditional printing work processes, and brought about a new attitude. The impact of the computerized technologies on the processes of the printing industry and accelerated technological development have set tasks to the managers and owners of printing businesses. The swift development is perceived as a huge challenge in particular by small and medium-size printing businesses.

2 EXPERIMENT

Similarly to other industries, in printing the integration of administrative and production processes in computerized networks has come into the focus of attention. The fundamental requirement of establishing more productive, flexible and transparent processes, automated production process streams, end-to-end workflow or networking are all aspects that need to be implemented. Non-networked printing production involves conventional processes based on analogous data. The purpose of network integration is the optimization of workflows via automation. With the JDF file format, graphic industry has created a standard that allows the linking of administrative and production processes in networks, the implementation of bidirectional digital communication (1) (2) (Figure 1).

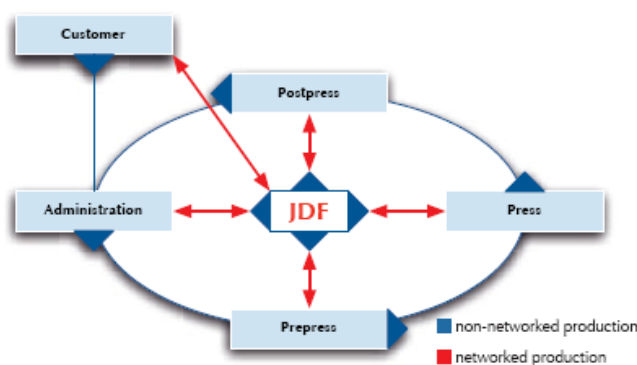


Figure 1: Network-integrated printing production (networking)

2.1 Method of the analysis of the technological levels of networking

The method of the examination of the technological level of networking in the printing industry relies on the assessment of the conditions in the production flow of the printing company and the collection of information in relation to the operation of the enterprises, and for this purpose it applies a well-structured, comprehensive questionnaire, as well as devices for the demonstration of the outcomes of the questionnaire.

For the purpose of the analysis, the main printing processes have been classified into nine groups.

Elements of the main flow of printing production:

1. Request and estimate
2. Calculation and accounting
3. Electronic job ticket
4. Materials management
5. Electronic planning
6. Operational data recording
7. Prepress
8. Press
9. Postpress

The percentage values of the elements of the main flow have been established with the use of a questionnaire-based assessment of the prevailing conditions. The questionnaire compiled for the analysis is related to the nine topics described above. The % values of the main flow have been presented in the form of a web diagram prepared with the use of Excel (Figure 2).

In Figure 2, the values of the elements of the main flow ranges from 0% to 100% in view of the responses given to the questions of the individual topics. The answers to the questions can be: YES, NO, %. 100% has been assigned to "YES" responses, and 0% has been assigned to "NO", while to certain questions answers can fall anywhere in the range of 0–100%. Within the framework of the evaluation, the same importance has been attributed to all the questions belonging to a specific topic, and therefore the % values of the elements of the main flow corresponds to the arithmetic mean calculated on the basis of the % evaluation of the responses given to the individual sub-questions.

The web diagram demonstrates the technical–technological level of the printing enterprise in three dimensions (current status, desired status, technically feasible status).

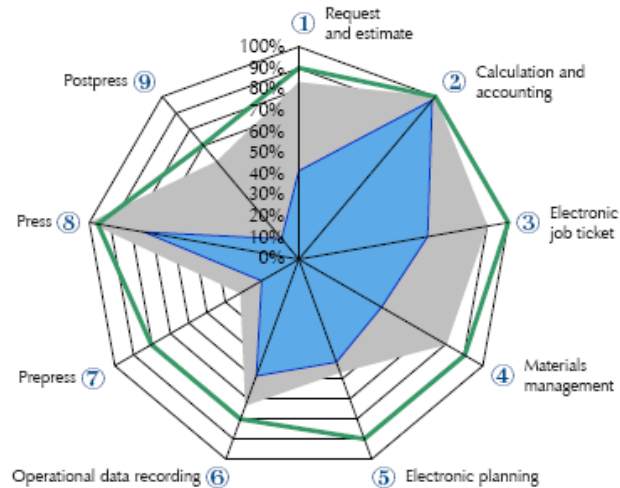


Figure 2: Properties of the web diagram

■ Current status

The blue area shows the actual technical and technological level of the printing enterprises. This part is to be updated continuously. The blue area of the graphic presentation serves the illustration of technological development and the progress of networking.

□ Volitional status

The area of the diagram enclosed by the green line reflects the technical–technological level, conditions that the printer wishes to reach by the completion of the development project.

■ Technically feasible status

The grey area shows the potential (feasible) technological level of the examined printer from the perspective of the manufacturers. 100% corresponds to the maximum potential technical and technological level that the manufacturers can satisfy. The blank field between 100% and the grey area is in fact a gap that cannot be closed, bridged with the currently available equipment and means of the printer.

3 RESULTS

3.1 Analysis of the technological level in small and medium-sized printing companies

The method of the examination of the technological level of networking in the printing industry relies on the assessment of the conditions in the production flow of the printing company and the collection of information. In order to realistically demonstrate the prevailing status and changes of production processes as integrated with processes in networks, the characteristics of administrative and production processes, as well as machinery and other devices belonging to the processes have been analyzed in six domestic printing enterprises, and then these elements have been evaluated with the use of the questionnaires.

Currently, none of the examined printing businesses uses JDF/JMF file formats for the bidirectional communication of the processes. Printing company 1 has already installed a JDF-based information



system, while in the technological workflow systems, in the field of prepress and printing PPF file formats are used for the registration of production data and the automated setting of ink zones. Printing company 2 has a JDF-based MIS system and technological workflow systems in the field of prepress. It also operates a set of modern printers, printing has already been networked, but no binding is in place. Printing company 3–5 have focused on the development and automation of printing recently. Printing company 4 and 5 transfers the digital data created during the preparation of the digital form in order to adjust the ink zones of the printers, but the CIP4/JDF file format is not used. The flows and machines of printing company 6 are not networked.

The average technical–technological level of networking has been established in relation to printing company 1–5 (Table 1, Figure 3); in this context, the printing company running production processes without networking (printing company 6) has not been taken into consideration.

Table 1 : Average values for the technological level of networking calculated for the examined printing companies

| Parts of the printing workflow | Actual value % | Volitional value % | Technical value % |
|------------------------------------|-------------------|-----------------------|----------------------|
| 1. Request and estimate | 35 | 90 | 97 |
| 2. Calculation and accounting | 95 | 100 | 100 |
| 3. Electronic job ticket | 62 | 100 | 90 |
| 4. Materials management | 45 | 70 | 80 |
| 5. Electronic planning | 48 | 77 | 57 |
| 6. Registration of production data | 58 | 80 | 80 |
| 7. Prepress | 20 | 84 | 34 |
| 8. Press | 57 | 98 | 97 |
| 9. Postpress | 13 | 70 | 85 |

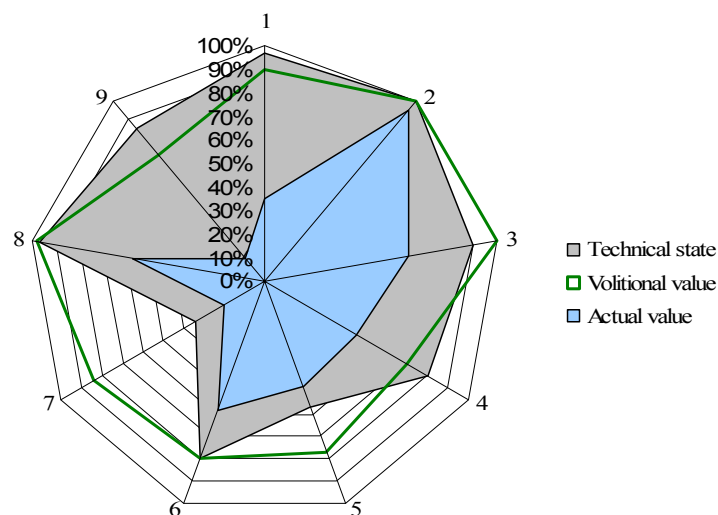


Figure 3: Average technological level of networking for the examined printing companies



3.2 Financial analysis of networking

Basis of the financial analysis:

- ◊ The financial analysis has been conducted for printing company 1.
- ◊ Phase 1: MIS system, technological workflow systems, installation of web terminals.
- ◊ Phase 2: values after the technical realization of networking, networking is still based on CIP3/PPF standards.
- ◊ Phase 3: networking based on CIP4/JDF standards in the field of prepress, printing and binding, with the use of the MIS system.
- ◊ Estimation of cost-efficiency, evaluation of changes with the CIP4/JDF standards in Phase 3.
- ◊ Analysis of networking for a period of 5 years.

To establish the magnitude of costs to be expended on the networking project, several components have had to be examined. In addition to the actual prices of hardware and software devices, costs are also incurred with installation, training, compensation to experts configuring the systems, the relocation of operators from production, as well as other complementary costs, such as the construction of the network

The integration of processes in computerized networks calls for sizeable investment costs. In line with the technical–technological requirements, the following investments are necessary:

- modern technological equipment
- management information system (MIS)
- technological workflow systems
- control consoles
- interfacing software (interfacing of the equipment of various manufacturers)
- updates

Table 2 summarizes the investment costs of the networking project.

Table 2: Total investment cost of networking

| Cost type | Amount, EUR |
|---|-------------|
| Costs of hardware and software (networking) | 49,500.- |
| External cost | 30,200.- |
| Internal cost | 20,528.- |
| Total cost | 100,228.- |

Effective benefit can be used to describe cost-efficiency (Table 3).

Table 3: Annual savings and effective benefit of networking

| Areas | Savings, EUR | | |
|-------------------|-----------------|--------------------|-----------------|
| | Phase 1 | Phase 2 | Total |
| MIS | 17,400.- | no further savings | 17,400.- |
| Prepress | -1,500.- | 22,000.- | 20,500.- |
| Press | 22,720.- | 10,700.- | 33,420.- |
| Postpress | -20,400.- | 25,700.- | 5,300.- |
| Additional saving | 720.- | 100.- | 820.- |
| Benefit | 18,940.- | 58,500.- | 77,440.- |
| Repeated costs | 12,200.- | 12,200.- | 24,400.- |
| Effective benefit | 6,740.- | 46,300.- | 53,040.- |



In the examined period of 5 years, the effective profit amounts to approx. the double of costs. The studied printing company arrives at profitable operations within the upcoming 5 years, and in the light of the analysis networking ensures cost-efficient production (Table 4).

Table 4: Cost-efficiency of networking in printing company 1

| | |
|--|----------------------|
| Cost: | EUR 100,228.- |
| ◇ Year 1: | EUR 6,740.- |
| ◇ Year 2–5 ($4 \times$ EUR 46,300.-): | EUR 185,200.- |
| Effective benefit for 5 years: | EUR 191,940.- |
| COST-EFFICIENCY: | 1.9 |

4 CONCLUSION AND DISCUSSION

In the course of our studies conducted in six domestic, small and medium-sized printing companies, detailed analyses were performed on the status of the integration of processes and machines in computerized networks, as well as the technological level of the printers in questions. The analysis has led us to the following findings.

The examined small and medium-sized printing companies typically apply certain solutions for the automation of subtasks (workflow systems of subtasks), thereby creating “island systems”. Therefore, the integration of the software products purchased from different manufacturers in the production flow of printing may hinder the networking of the various processes, the linking of these workflow systems. On the basis of the assessment of the prevailing conditions, it has been ascertained that with the exception of one or two printing enterprises prioritizing innovation full-scaling process automation does not form a part of the companies’ strategic objectives.

The analysis of the printing companies has suggested that the process of networking still has not been completed at the examined printers, it is rather in continuous development (gap between the areas enclosed by the blue and green line). Figure 3 shows that there are large differences between the current and technologically feasible conditions (blue and grey areas) as a result of the level of the development of the equipment and devices that are currently operated by the printing companies. For this reason, the technically feasible conditions of networking can be implemented only by means of further investments, and the associated investment costs can be determined by way of analysing the production processes of the individual printers in details.

When assessing the networking investment, only the networking costs were taken into account; it was possible, because the examined printing company (printing company 1) was in fact in possession of the networking requirements, the technological workflow systems had been installed, and furthermore processes had been optimized. The financial analyses point out the right direction to take with the implementation of networking, as well as the potentially resulting profit. However, it is to be noted that the studies have been based on the daily analysis of a short period of time, which has served as the basis of theoretical estimations for a whole year. As the analysis is partly based on theoretical estimations, in practice – after more accurate quantification – smaller values are expected to occur.

5 REFERENCES

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