

# A MODEL FOR IMPLEMENTING TQM IN THE GRAPHIC ARTS INDUSTRY

*Davor Donevski, Diana Milčić, Dubravko Banić*

Subject review

The most important criterion for pronouncing a certain production process to be successful is that it produces products of the desired quality level. Attaining quality is the aim of every production process. Achieving superior quality is possible by ensuring that a production process is being conducted under the best possible conditions. Another important step toward quality is employee education. Ensuring the best production conditions and the best education of employees requires enormous investments and does not lead toward optimization because the costs of quality become too high. Printed material has the aim of meeting certain requirements for quality in order to successfully transfer the message to consumers on the competitive market. In the production process of this dynamic, every fault results with delays in delivery and quality reduction. This paper investigates current approach to quality in the graphic arts industry, and elaborates the model of applying knowledge from the field of quality management to the printing industry.

**Key words:** *graphic arts, print production, quality, TQM*

## Model implementacije TQM-a u grafičku industriju

Pregledni članak

Najvažniji kriterij proglašavanja nekog proizvodnog procesa uspješnim je sposobnost tog procesa da proizvede proizvod tražene kvalitete. Postizanje kvalitete je cilj svakog proizvodnog procesa. Superiornu kvalitetu moguće je postići osiguranjem najboljih mogućih uvjeta u kojima se odvija proizvodni proces. Druga važna aktivnost je edukacija kadrova. Osiguranje najboljih mogućih uvjeta i najbolje edukacije kadrova zahtijevaju velika ulaganja pa troškovi kvalitete postaju previsoki. Takav pristup, ako i jest praktično izvediv, ne vodi optimizaciji. Tiskani materijal mora udovoljiti određenim zahtjevima za kvalitetom kako bi na konkurentskom tržištu uspješno prenio poruku potencijalnom kupcu. U tako dinamičnoj proizvodnji kao što je grafička, svaka greška uzrokuje kašnjenje i pad kvalitete. U ovom članku izneseni su rezultati istraživanja trenutačnog stanja u grafičkoj industriji i prijedlog modela implementacije znanja s područja kvalitete u grafičku proizvodnju.

**Ključne riječi:** *grafička proizvodnja, kvaliteta, tisak, TQM*

### 1

#### Introduction

##### Uvod

Traditional approach to quality relies on the prevention of defective products being shipped to the customers. This approach results in high percentage of products being discarded or reworked, which makes it highly ineffective. In the 1950s, Japanese companies looked up to the quality improvement ideas of such western experts as Deming and Juran, and chose their approach. That was the prevention of the defective units being produced at all, [1]. A core objective in the prevention of defects is the reduction of variation. All units being produced in a certain production process vary to some extent. Those variations depend on the four most important factors: machinery, people, method and materials. The question whether these variations do or do not have any effect on quality can be answered only by measuring variations, and TQM provides tools for that. The process management systems designed for the printing industry have developed significantly over the past 30 years, and those technological improvements facilitated the reduction of variation and collecting of data. However, technology alone does not lead toward the goal of TQM, which is continuous improvement in quality. This requires the involvement of the company's employees. Every participant who contributes to improvements in one segment in a series of processes contributes to the final cost-effective quality. The implementation of TQM is based on the gradual introduction of the problem-solving tools and techniques, such as the seven quality control tools (QC7). Tools and techniques are used in a well planned investigation with the aim of making improvements, and a typical method of TQM is the PDCA (plan, do, check, act) Cycle, also known as Deming's Wheel.

### 2

#### Evaluation

##### Procjena

This section analyzes the print production processes and investigates the current state in the printing industry. The cause-and-effect diagram (Figure 1) shows major categories and processes affecting the final quality of a product or service.

The prepress stage is a common source of faults, [2]. Desktop publishing (DTP) allowed non-experts to design their pages, which resulted in files which are not suitable for production. Some print shops have created instruction manuals with file specifications and requirements and lists of most common prepress faults for their clients. This significantly reduced the number of incorrigible prepress work and lead toward meeting customer's needs.

The storing and conditioning of raw material, particularly paper is very important. As storage and production rooms are usually separated, the air temperature and relative humidity are different in each. As paper is hygroscopic, these factors affect its moisture absorption, which results in dimensions change. Depending on the amount of difference between conditions in storage and production room, the paper should be conditioned for a certain period of time in the production room to reach stability. This requires additional space which is usually not available in the production of this dynamism.

The production processes, both press and postpress, should be monitored and data should be collected continuously. This is rarely done in practice. Collected data can be used to optimize processes and reduce variation. Simplified methods of the DOE (Design of Experiments) can lead toward significant improvements.

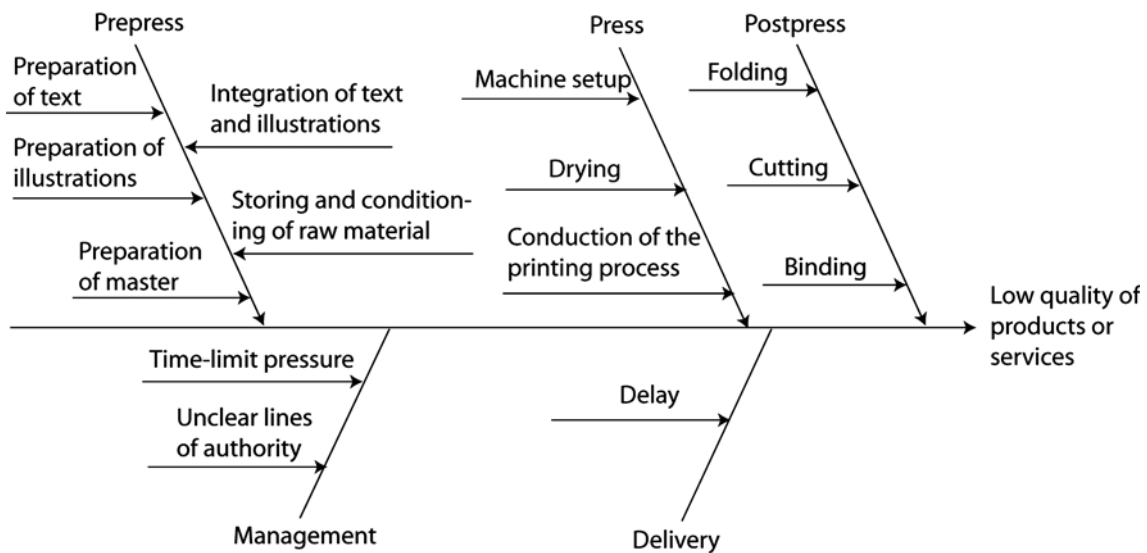


Figure Cause-and-effect diagram for the print production  
Slika 1 Dijagram uzrok-posljedica za grafičku proizvodnju

A survey has been conducted with the aim of determining current state in the printing industry. A query consisting of the following questions was passed to 30 small, mid-sized and large Croatian print shops:

1. Do You test properties of paper?
2. Do You test properties of repro material?
3. Do You select repro material with certain properties depending on the job demands?
4. Do You calibrate devices?
5. Do You use any color management system?
6. Do You use either CtF or CtP setter?
7. Do You check the original and make corrections on it?
8. Do You check the plate-plate exposure apparatus compatibility?
9. Do You determine exposure time for every plates batch?
10. Do You check developed plates for errors?
12. Do You setup the printing machine depending on the substrate?
13. Do You use different offset blankets depending on the job demands?
14. Do You use any process control tool?
15. Do You use visual control bars?
16. Do You use measurement control bars?
17. Do You use any process management system?
18. Do You use statistical quality control tools?
19. Did You implement ISO?

Figure 2 shows the query results. The results indicate that raw materials are not tested at all. Quality management systems and methods are most common in the prepress stage. The sophisticated equipment used in this stage is relatively cheap. The print production (press) stage uses more simple and affordable tools because of the high costs of sophisticated electronic equipment. The interesting result is that sophisticated equipment is equally common in small and medium sized companies. Statistical quality control tools are rarely used because most employees are not educated in this field.

### 3 Implementation

#### Uvođenje

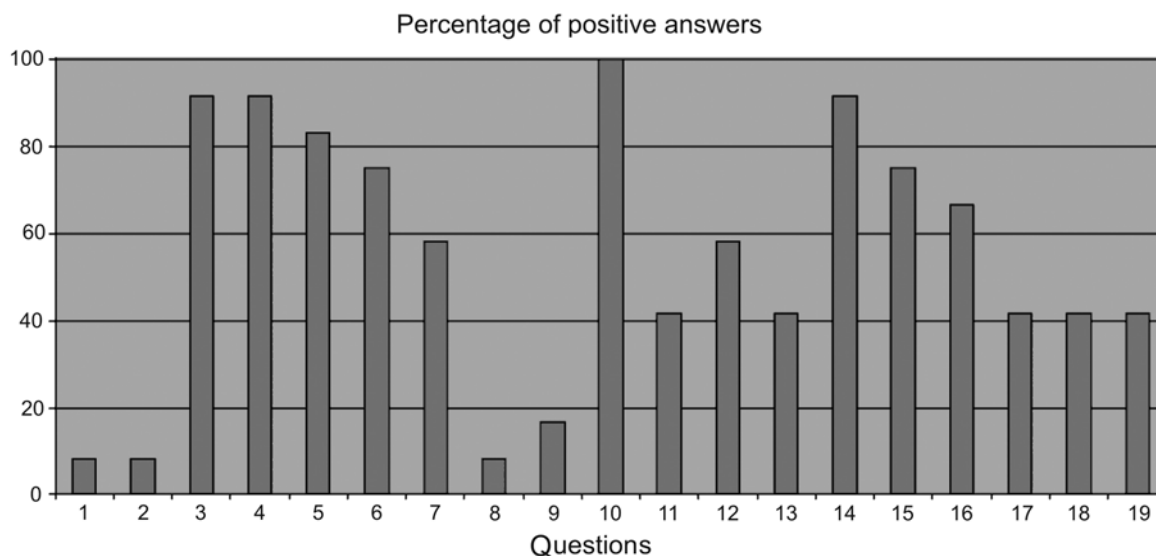
#### 3.1

#### Leadership

#### Vođenje

The first thing that a company has to do is to define its philosophy. Then it has to prepare long-term and mid-term management plans. From these plans, it has to define its annual goals and measures required to achieve them. The described procedure is known as policy management, and requires the commitment of the Chief Executive Officer and senior managers. When the annual management policies are established on the highest management level, they should be deployed down the organization. Those at lower levels should make their own policies based on the annual management policies, and prepare plans to implement them. Checking whether the policies are implemented as planned should be carried out regularly. As stated in [3], reflection on the annual management policies is also important, and should be done at the end of each year with the aim of acquiring feedback for future improvements. The print production can be specialized for only one product, such as newspaper or package. This has the advantage of precise capacity planning as it usually concerns products which are well established on the market. This production is oriented on only one or just a few customers dealing with huge orders, and is therefore seriously endangered in the case of product failure. Another type of print production, oriented on small markets of various products, has the advantage of flexibility, but is consequently less efficient in producing a certain product.

Chief Executive Officer's primary function is to establish a quality policy, to involve employees in realizing it, and to present it to the customers. Chief Executive Officer is also responsible for the overall organization of the company, and should clearly define tasks of each department, and responsibilities and authority of each employee. The aim of every company is to satisfy its customers. The key to this is setting up the procedures of dealing with customer's claims, and setting up the system for analyzing their claims. Regular quality audits should be



*Figure The query results*  
*Slika 2 Rezultati upitnika*

carried out to determine whether the quality activities are being carried out, and whether they are achieving the results. Similar evaluation should be carried out internally, to determine whether the departments understand the basic concepts of quality control, and whether they are implementing them in their daily tasks. Quality control manuals containing the rules and standards for the assurance, maintenance and management of quality can be prepared and used as the company's basic document for implementing quality control. When establishing quality control, non-manufacturing departments are often neglected. Managers are responsible for implementing quality policies in their departments, and for defining jobs, responsibilities and authority of their employees. Managers should monitor the quality of the work in their department, keep records, make improvements, and keep their employees informed of how the department is performing. To maximize the performance of their employees, managers should make sure that they follow the standards. Employees could be involved in making improvements by setting up a suggestion scheme or by quality control circle activities.

### 3.2

#### The work environment

##### Radno okruženje

Workspace organization has a great impact on efficiency. An important step in organizing workspace is disposing of what is no longer needed. This saves space, clears passageways and prevents accidents. Setting up a storage system eases search for required items. Setting up an efficient inventory system ensures optimal quantities of raw materials, products and parts kept in stock. Marking passageways for both employees and moving goods ensures safety of employees and easy movement of goods and employees. Print shops often keep films and printing plates for reuse. This requires space and a good indexing system because any setback can be more costly than production of new films and plates. Delivery of raw material for the stock to the printing press is another issue. When printing large circulations, the key is maintaining optimal stock of paper in

the production room in order to maintain enough space and clear passageways. Integrated management systems with incorporated messaging system help achieving coherence between departments.

An important step of TQM implementation is making a workplace clean and tidy in order to protect health of the employees. This implies setting up a waste collecting and storing system, and establishing standards for the cleaning activities. The 5S activities come from the Japanese practice of TQM, and 5S stands for: Seiri (organizing); Seiton (keeping things neat); Seiso (cleaning); Seiketsu (cleanliness); Shukanka (make cleanliness a habit), [3]. There are also other factors, like temperature, humidity and right levels of lighting that make a workplace healthy and comfortable. They should be maintained at appropriate levels. Noise, odor, vibrations and dust should be reduced as much as possible. A common problem in print shops is paper dust. It comes from cutting paper in different phases of the production process. Paper and cellulose dust do not pose any significant health hazard, but do present a comfort problem. The printing process itself presents a greater problem because some printing inks use volatile organic compounds. The most common printing technique, offset printing, requires the use of water in its dampening system, and some dampening systems use isopropyl alcohol which is a health hazard. Except for keeping cleanliness inside the factory, a company is also responsible for environmental protection. This implies the setting up of standards for disposing of waste.

Another important segment of TQM is ensuring the safety of employees. Accidents can be prevented by marking emergency exits and putting up warning signs. Providing formal safety education and promoting safety awareness also helps avoiding accidents. Providing protective clothes and tools and checking if they are used properly helps reducing the risk of injuries when accidents do happen. Facilities and equipment can be sources of danger, and safety inspections should be carried out when purchasing and renovating them. Regular and standardized maintenance helps reduce risks. Keeping accident records helps preventing past accidents recurring.

### 3.3

#### Systems and tools

##### Sustavi i alati

Standardization is essential for maintaining and improving quality. Standards describe the best way of doing a job, carrying out an operation, or completing a process. All of the company's operations and procedures should be standardized and work instructions, based on those standards, should be prepared for employees to use in their jobs. The use of integrated process management systems leads toward standardization. The International Cooperation for the Integration of Processes in Prepress, Press and Postpress Organization (CIP4) is a Standards Development Organization for the graphic arts industry. Currently, all prominent equipment vendors design workflow systems according to the standards provided by CIP4.

Ways of dealing with abnormalities have a great impact on quality. When abnormalities are spotted, standard procedures should provide an efficient way of dealing with them. The first thing to do when abnormalities occur is take emergency actions which will prevent or stop making damage. After that, the causes should be investigated. When the causes are detected, countermeasures should be implemented, and if efficient, standardized as the successful countermeasures. All these actions require a set of rules, known methods and responsibilities, to be carried out. Collecting the data and interpreting them with tools such as control charts help identifying the causes of abnormalities.

## 4

#### Conclusion

##### Zaključak

The printing industry has not yet adopted the concepts of TQM. The use of integrated management systems which strictly define and standardize processes covers one segment, but the most important segment, the tendency of every individual to make continuous improvements is not yet covered. Statistical quality control tools are not very common because people in this industry are generally unaware that such methods exist. This is especially pronounced in small and medium sized print shops. We could conclude that technology imposed quality and process management. However, quality control and the concept of making continuous improvements, which depend on the companies' approach, were neglected. Improvements can be achieved by competent managements with long-term plans of gradual adoption of changes.

## 5

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#### Authors' Addresses

Adrese autora

##### *Davor Donevski*

Faculty of Graphic Arts  
Getaldiceva 2, Zagreb, Croatia  
davor.donevski@grf.hr

##### *Diana Milčić*

Faculty of Graphic Arts  
Getaldiceva 2, Zagreb, Croatia

##### *Dubravko Banić*

Faculty of Graphic Arts  
Getaldiceva 2, Zagreb, Croatia