

International Circle of Educational Institutes  
of Graphic-Media Technology and Management

**IC** international  
circle



**52nd** annual conference of IC  
“Print Education – Challenges  
in an Uncharted World”

**CONFERENCE  
PROCEEDINGS**

Athens, September 2021







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GRAPHMEDLAB - the Hellenic Graphic-Media Research Lab, University of West Attica, Greece

iarigai – the International Association of Research Organizations for the Information, Media and Graphic Arts Industries

IC – the International Circle of Educational Institutes of Graphic-Media Technology and Management

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## Preface

Dear participants of the 52nd IC conference

Dear colleagues and friends of the Graphic Communication, Print, Media and Packaging fields,

Some two years ago, we have undertaken the responsibility for the joint organization of iarigai and IC conferences in Athens, Greece. Meanwhile, COVID-19 appeared, changing and challenging our lives with unprecedented situations. We have accepted the challenge and we have undertaken the high risk to organize the conferences, despite the lockdowns and restrictions in personal contacts and travel.

With vaccination progressing, but still challenged by COVID19, we finally managed to organize the conferences in a hybrid form. The most positive message is that finally, we were able to meet in person and at physical space and interact with our colleagues from around the world of print education and technology.

Therefore, we at HELGRAMED, The Hellenic Union of Print Media Engineers, in cooperation with GRAPHMEDLAB, the Hellenic Graphic-Media Research Lab, University of West Attica, are proud that we could be able to organize the conferences, despite the negative impact of the pandemic.

In the conference proceedings of the 52nd annual conference of IC with the title “Print Education – Challenges in an Uncharted World”, you will find the abstracts from our colleagues that participated in person or from distance and presented their scientific work at the conference.

As the Chairman of the IC and director of the conferences and on behalf of the entire organizational team, we do hope to meet again in person at the next IC conference in 2022!

**Prof. Dr. Anastasios E. Politis**

Chairman of the IC

Director of the iarigai and IC conferences

September 2021, Athens Greece



# Scientific committee

## Chairs of the Scientific Committee:

Dr. Chrysoula Gatsou, University of West Attica, Greece  
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Georgios Papadimitriou





52nd IC conference  
Athens, Greece September 2021

**Print Education – Challenges  
in an Uncharted World**

**Conference proceedings  
Abstracts**



## **SESSION 2**

# **Print Management and Technology**



## Materials & Illusions

### Inks & Tricks

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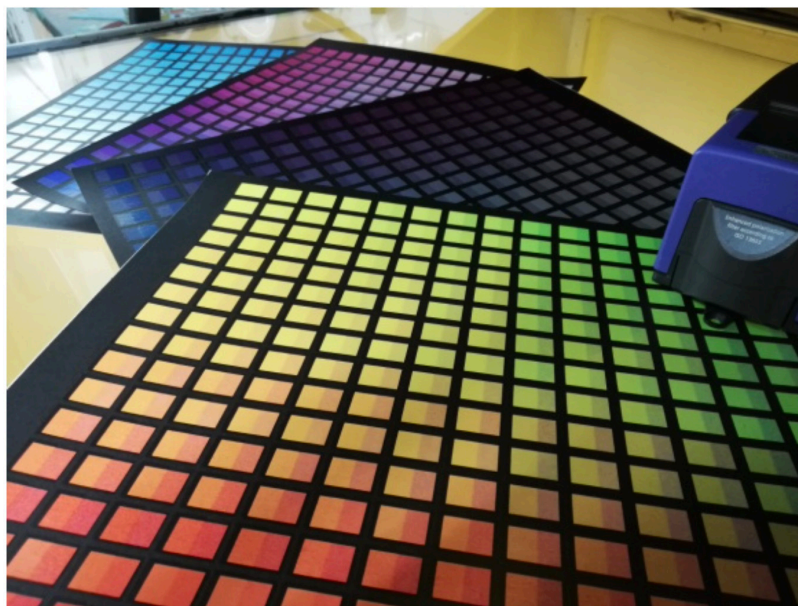
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### Keywords

High quality print reproduction, halftone screening, tonal reproduction, color chart, hybrid separation

### ABSTRACT

Printing science since its existence was based on the material interaction. Color theory is extended used to Print Media products in order to communicate feelings, brandings and industrial production. Color is a way to secure the supply chain and the handling of the message by the proper way to the final consumer. Printers reproduce images by the CMYK separation technique. A technique that is based on a pseudo-tonal reproduction of prints rather than a continual tonal reproduction (contones) as they captured in the real world. In the early 20<sup>th</sup> century, images were printed just with 4 tonal values for each color channel and the image was acceptable in reference to the tonalvalue (early comic publication). Printing results on an ungraded tonal scale and on a graded and parametrically defined pseudo-tonal scale are both optimized rendered. In both separation methods there are specific limitations on the reproduction of the original information in multiple copies. Although the visual effect is measurable in color management systems, using modern color analysis tools, a human skilled eye could be the toughest judge. The visual comparison of the scaled reproductions determines the difference between perfect or non-perfect printing.



*Figure 1 Printed color charts on coated & uncoated carton*

The resulting color effect from pure material impressions is comparatively superior to the corresponding pseudo-tonal even if it yields an image with a smaller range of total tonal values. The printing result is repeatable in all comparisons of the same printing series. Due to the fact that the human eye is more familiar to the behavior and the interaction of materials with the light the creation of the color effect resulting from the tonal reproduction it is perceived as a much more physical reproduction compared to the pseudo-tonal one.



*Figure 2 Printing tonal separation result of artwork reproduction*

This assumption, applicable to high-resolution reproductions, justifies the choice of tonal separations in artwork or graphic arts products with increased color requirements. Color difference ( $\Delta E$ ) between both methods (tonal and contonal) may be negligible but final optical result is the one that determines the successful reproduction.

In this study Color Charts were reproduced with silkscreen printing on both coated and uncoated cartons. The final color result was achieved by the reprint of inks with specific tonal value on printing area, each one of them working additive to the previous. Color Difference between coated and uncoated areas was calculated for all produced chart cells. Two Color Charts (65,536 tonal combinations each) were produced and both color spaces were visualized. A tonal Artwork was reproduced as a result of the current study in order to proof the accuracy of the proposed separation method. This research will be useful for high fidelity print artwork reproduction since it helps us to understand the manner that consecutive coating affects the printing result. The proposal of tonal reproduction worked effectively on a fine art reproduction.

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## Corporate Social Responsibility practices in the Greek Graphic Arts-Printing Industry

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### Keywords

Corporate Social Responsibility, basic principles - characteristics Graphic Arts - Printing Industry.

### ABSTRACT

Corporate Social Responsibility - CSR, is considered a dynamic concept which nowadays is taken under serious considerations by companies of all business sectors. Research conducted reveals that its importance increases over the years as it concerns the whole society and in essence reflects its basic principles. Being a generic concept, it is interpreted quite diversely and is applied differently in various sectoral domains.

CSR has specific characteristics and guidelines. In particular it is based on the fact that business organizations - companies are highly interested in influencing their economic, environmental and social efficiency, involving it with employees, consumers, local communities, investors and future generations. Hence, the existing literature presents several gaps in research on the actual application of CSR and the results in the overall progress of the companies.

Initial study in the Greek business organizations reveals that CSR application is a concept applied mainly at Large scale corporations and companies, regarding in particular, Banking and Insurance sectors. In addition, there is no report or research concerning the Graphic Arts - Printing industry as it regards the application of CSR concepts.

Therefore, research is focusing on the investigation of the application of CSR in the Printing Industry and in particular in the Greek Graphic Arts-Printing Industry. Among the fields to be investigated are the matching of the specific characteristics of the Printing sector with the guidelines / specifications of CSR concepts.

Further, it will be investigated whether and to what extent the Graphic Arts - Printing companies do indeed apply CSR practices and if so which are the characteristics of CSR application. In addition, the study will concentrate on the potential benefits of CSR in the Graphic Arts - Printing industry compa-



nies which operate in Greece. A final research objective in which way are companies affected by the integration and application of the practices such as Corporate Social Responsibility in the operation of companies of the sector in discussion.

Research will be conducted with the application of a structured questionnaire which will be distributed at the Greek Graphic Arts - Printing companies in Greece.

The collection of first responses from the companies will be analyzed so concrete outcomes can be derived at least at an initial phase on the actual contribution of CSR in the overall performance of the Graphic Arts - Printing Industry.

## **Measuring color in digital printing: digital printing standardization**

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### **Keywords**

Color management, Digital printing, Standardization, developments, technologies

### **ABSTRACT**

Color communication is in general, one of the most important factors in printing. There are a lot of parameters that affect color in printing, which vary significantly at different printing technologies and methods. One has to study the methodology, the processes, the substrates and the techniques behind each printing method, to ensure the best procedure for accurate color management, control and final output, under specific guidelines.

One of the latest printing technologies is Digital Printing; Its first introduction was in 1982, but last years there has been established as one of the most rapidly evolving printing processes. In the years that followed, digital printing became one quite significant new technology for print media production.

Digital printing has brought significant changes in production workflow and in the total landscape of media market. Compared to offset printing, where consistent aim values and guidelines have been a reality for conventional printing by means of ISO 12647-2, developments in Digital Print Standardization remain unattainable. This basically depends on two factors, which are interrelated:

- Firstly, the term “digital printing” is hard to be specified under a general description since there are various printing technologies applied.
- Secondly, there are substantial difference on substrates, by means of data preparation, process control and image quality requirements.

Therefore, it is not possible to standardize color and apply of standardization activities at all digital printing processes and this is our research challenge. After all, digital printing is versatile and variable in every way therefore it cannot be standardized under one specification.

### **Determination of a color management process for digital printing processes**

Extended research on the digital printing technologies, processes and workflows is needed, to de-

termine if a color management process can be applied and if possible, to which specific applications. Since color is very important to printing, especially in packaging and marketing applications, it is nowadays required for matching colors across technologies, substrates, materials, colorants and stakeholders (eg. retailers, brand owners, designers, prepress and printers).

Therefore, this paper intends to point out the developments in Digital Print Standardization, using the appropriate technology (hardware and software components) and the appropriate knowledge of Color Management.

Within the paper, an analysis of the current industrial typical guidelines ranging from data creation all the way to printing will be made. Further, current developments, originating various manufacturers of digital printing systems and by experts in guidelines and specifications such as Fogra and IDEAlliance for output process control and colour fidelity, will be reviewed.

As such, this paper can be regarded as a first attempt to preview the basis where standardization for digital printing processes can be developed.



## **SESSION 3**

### **People and Print: Initiatives for Print Education**



## Print Your Future Initiative

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### Keywords

Young workers, young talents, skilled workforce, recruitment, print and media sector

### ABSTRACT

#### Introduction

The Print Your Future (PYF) initiative is an EU funded project with the aim of attracting a new skilled workforce for quality jobs to the European graphic industry. It's a 24-month project funded under Social Dialogue (VP/2019/001/0061) about future skills and recruitment in the printing industry, running from February 2020 until January 2022. The project focuses primarily on 4 countries: Estonia, Germany, the Netherlands and Portugal.

The European printing industry faces a double challenge: to attract a new generation to the sector, and to ensure appropriate VET studies are taken up in order for these new recruits to acquire the very necessary technical skills in a continuously changing technological and digital environment. It is within this context that the European Social Partners for the graphical sector, Intergraf and UNI Europa Graphical, have set three specific objectives to achieve in a project:

- diagnosis
- capacity building & implementation
- communication campaign.

#### Methods

the project work is organised into 4 work packages:

##### 1. DIAGNOSIS

The main goal is to analyse, through off-line research and on-site activities, all elements that can increase the opportunities for young people to enter the printing industry, with a systematic involvement of all stakeholders, such as companies, associations, trade unions, VET providers, schools and universities and employment offices.

The two most important factors to be considered when defining strategies for improving the attractiveness of the sector toward young workers are:

- the Recruitment of young people, defined as the process of training and hiring new people and providing them with the necessary skills and opportunities to work in the printing industry
- the Employment of young people, defined as the sum of measures specifically designed to improve the working conditions of young new incomers

These two factors have been analysed in depth in order to identify common problems, possible solutions in place in Europe and, among them, the best practices with a high replication potential at European level. Surveys and interviews have been conducted.

##### 2. CAPACITY BUILDING & IMPLEMENTATION

In this work package the goal is to create a common framework for the implementation of actions that can promote the recruitment and employment of young people. Best practices identified in the

previous WP will be analysed in depth and/or implemented in pilot activities on the territories of the 4 target countries (Estonia, Germany, the Netherlands and Portugal). Information collected in this work package will be presented in a 'Toolkit for the inclusion and retention of young workers in the printing industry'. The gathered information is presented on a dedicated website <https://printyourfuture.eu/>

### 3. PROMOTION, DISSEMINATION & COMMUNICATION TOOLS

The goal of this work package is to ensure the adequate communication of this project. They include the creation of a new sectoral identity, which will include collecting pictures which describe the work, interviews with young workers in at least 4 countries, a collection of information packages on job profiles, and documentation of concrete experiences of young workers. This will all be communicated in promotional photos and videos, on the dedicated website <https://printyourfuture.eu/>, and in a communications campaign including social media. There will also be 4 'Young Workers Day' events to promote the exchange of information.

### 4. FINAL CONFERENCE

In order to present all project results a final conference is envisaged. The final conference will be the main public event of the project, held in the second half of 2021. A final report for the project will also be written and published.

## Results

Since in the moment of submitting this abstract we are in the transition phase from WP2 to WP3 the mentioned website has been established and some interviews have been conducted but a lot of work still has to be done. Videos have been filmed but not finalized, yet. A comprehensive list of all schools and educational institutes in these countries have been compiled and can be found on the website.



At the date of the IC-conference there will be much more information available including the testimonials and videos.

## Conclusions

The subjects worked on in the ongoing project Print Your Future are essential for our whole branch and we, as the educational people should contribute our best to the attractiveness of our sector. The attendees are kindly asked to disseminate the information about this project and make usage of the results extensively.

## Developing an efficient scoring rubric as an assessment tool for educational material in Graphic Arts

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## Keywords

Learning outcomes, evaluation, scoring rubric, material assessment, reliability and validity

## ABSTRACT

The project Exchange Knowledge for Future Innovation (EKFI) primary objective is to create an exchange platform to facilitate the availability of innovative learning and research material, map the competence needs, and match those needs with the appropriate learning/research module(s) on the web-based platform. The material's uploading process is supported by the Intake application (O2) where the learning/research material is described and meet educational standard/formats to pass the initial requirements. The Search robot (O4) makes it possible for the user to map the competence needs and match the needs with learning/research module(s). The download of the material uses the Barter system purchase application (O3). It is an exchange system where goods are directly exchanged for other goods without using money as a medium of exchange. The Exchange platform can be applied for the project target groups: VET and HE institutes, SMEs, sector organizations, others in the Cultural & Creative Industries (CCI).

The material uploaded through the Intake application is identified in a standard manner using the European Qualification Framework. The EQF is divided into eight levels, starting from primary education to doctoral level equivalents. A level of achievement is assigned for any qualification. Each level consists of three components of, respectively, knowledge, skill, and competence, the latter being concerned with the qualification holder's exercise of autonomy and responsibility in work situations. The Intake application's main challenge is to secure and maintain the learning/research material's quality to fulfill the requirements stated previously.

Therefore, quality criteria and quality management should be further examined. For evaluating the educational material in Graphic Arts, we use a scoring rubric with three essential features: evaluation criteria, quality definitions, and a scoring strategy. Evaluation criteria are the factors that an assessor considers when determining the quality of the material. Also described as a set of indicators or a list of guidelines, the criteria reflect the processes and content judged to be necessary. For the needs of the development of the criteria of the scoring rubric, a survey was performed on professionals, teachers, students, experts on their needs for educational material in graphic arts.

We constructed the assessment rubric under the guidelines of previous papers on rubric development and standardization, reflecting that the educational material in Graphic Arts is much dependent on various factors and should therefore not be evaluated from an exclusively pedagogical perspective.

## What ideas do students really care about? Learnings from the first 300 teams Start-up BW ASAP (Academic Seed Accelerator Program)

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*Prof. Dr. Nils Högsdal*

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Submission on the topic: Distance learning – Innovative learning environments

## ABSTRACT

### Initial situation



Several German states - including Bavaria, Baden-Württemberg and North Rhine-Westphalia - have recently set up programs to promote entrepreneurship education. The focus of the projects, which are usually awarded on a competitive basis to several colleges and universities, is to raise awareness and enthusiasm among students and to impart skills. At the same time, numerous ideas are generated. One initial experience is that only a few students then take the next step, the development and validation of the business model. Further figures show that even more than young men shy away from this step for women. One hypothesis is that it is time-consuming, requires support and is not formally “rewarded”, i.e. it takes place alongside studies without ECTS. At the same time, however, there is also great potential: the evaluation of a course in the main study stage of the Bachelor’s program showed that less than 5% of the business ideas from the courses in the basic course (e.g. 4 of 107 ideas from a concrete Bachelor’s lecture over 12 semesters) are validated for suitability for founding or commercialization.

This rate does not look any better for research projects and other student projects either. However, in many cases there is a large gap between a good business idea (or a successfully completed research project) and the establishment of a company. There is a broad range of funding available for viable concepts, including EXIST, Young Innovators, Incubators and Accelerators, high-tech start-up funds and purely private-sector offers for later phases such as the Startup Autobahn.

The hypothesis underlying the present approach is that entrepreneurship education is a continuous process that leads to counselling and support for founders. If these transitions are missing, predetermined breaking points arise where promising projects are not continued. The present graph shows this process and the two goals of reaching more students and closing the gap during the pre-foundation phase in the validation of ideas.

### **Objective**

The aim of the project is to consolidate the statewide competition as a largely decentralized seed accelerator program. Susan Cohen first used the term “seed accelerator”. She defines them as “fixed-term, cohort-based programs, that include mentorship and educational components and culminate in a public pitch event or demo day. The important thing is that normally the pre-foundation phase is supported and above all accelerated. The aim is a quick validation of the business model. Classical accelerators the growth of a start-up with a functioning business model. As service centres, incubators support start-ups mainly in the early phase of their foundation with a focus on the realisation of the business idea. Seed accelerators are upstream and support the finding of a functioning business model and help to identify less goal-oriented approaches more quickly. It is not about avoiding these mistakes: “fail faster” is one aspect, the other is the structure of “validated learning”. Start-up BW ASAP uses modern approaches of the agile start-up world such as Design Thinking, Customer Validation and Business Model Generation with the goal of quickly validating the viability of an idea and the associated business models.

Start-up BW ASAP is designed as a cohort-based, largely decentralized program in the form of a competition with a uniform, well-founded set of tools and methods, which is especially adapted to the colleges and universities of the country.

It is built up in 5 validation challenges and thus phases:

*Figure: Division of the challenges including pitch coaching and final event*

The contents of the individual challenges were taught in a workbook (the Playbook). The aim of the Playbook is the successive validation of the idea and later the business model.

Each Validation Challenge consists of an introduction, which is supported by specific exercises and work with approved templates. Each chapter contains practical examples and literature tips. The

Playbook including the templates is freely accessible for teachers who want to integrate the Challenge into their lectures and has also proven to be a useful tool for the targeted preparation of existing teams.



Figure: Extract Playbook 2.0

## Results

The first run of the decentralized program and competition took place in the winter semester 2018/19 with 19 colleges and 5 universities. Meanwhile 42 different universities have participated, some of the every semester.

- 16 (of 20) universities of applied sciences
- 9 (of 9) universities
- 7 (of 20) state-approved private universities/colleges
- 1 (of 1) DHBWs (universities of cooperative education=
- 2 (of 2) movie and pop academies
- 5 (inter)national universities, thus students from partner universities

### *Figure: Distribution of participating universities and colleges in Baden-Württemberg*

A total of 178 students and research assistants in 62 teams took part in the Start-up BW ASAP competition. For the final pitch competition, 32 teams qualified with a total of 108 participants. In contrast to many other events in the start-up sector, ASAP achieved a significantly higher proportion of women (over 30%), which is roughly equivalent to the proportion of women in the overall population of the relevant degree programmes. This indicates that targeted support and, above all, curricular integration could help to noticeably increase the proportion of women in the next step towards founding a business.

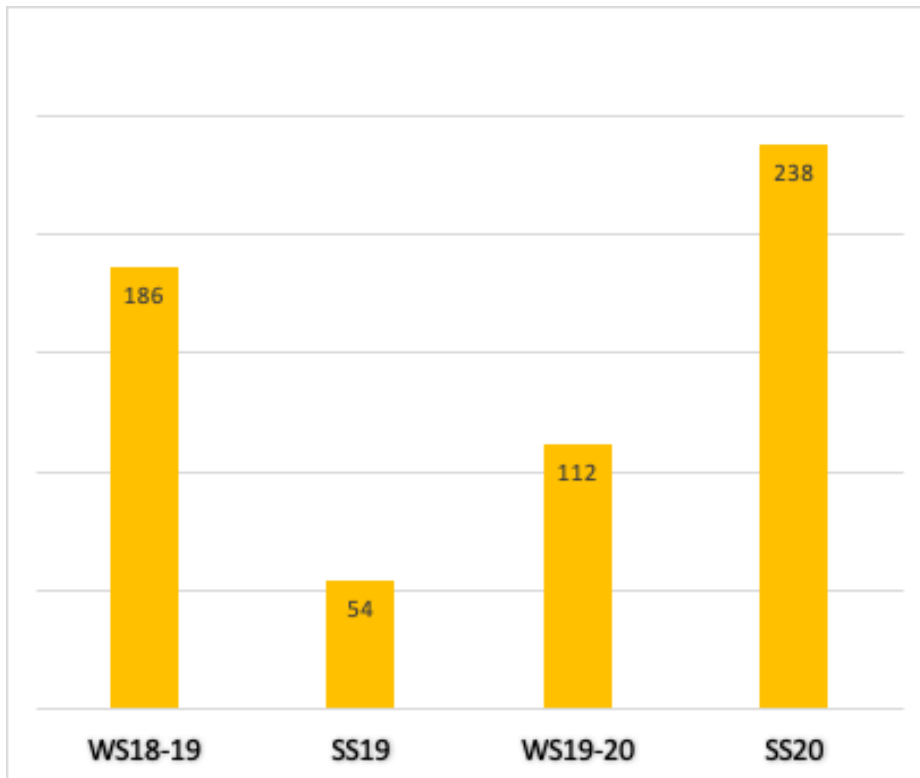


Figure: Development of participants (2021 figure will be available during the conference)

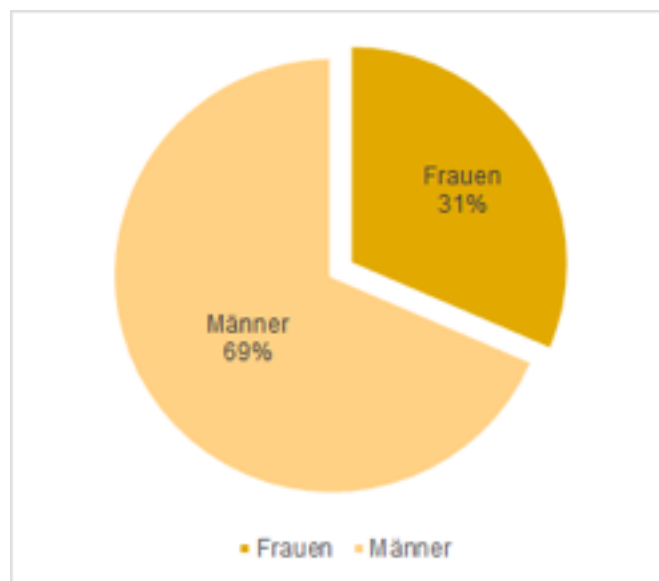
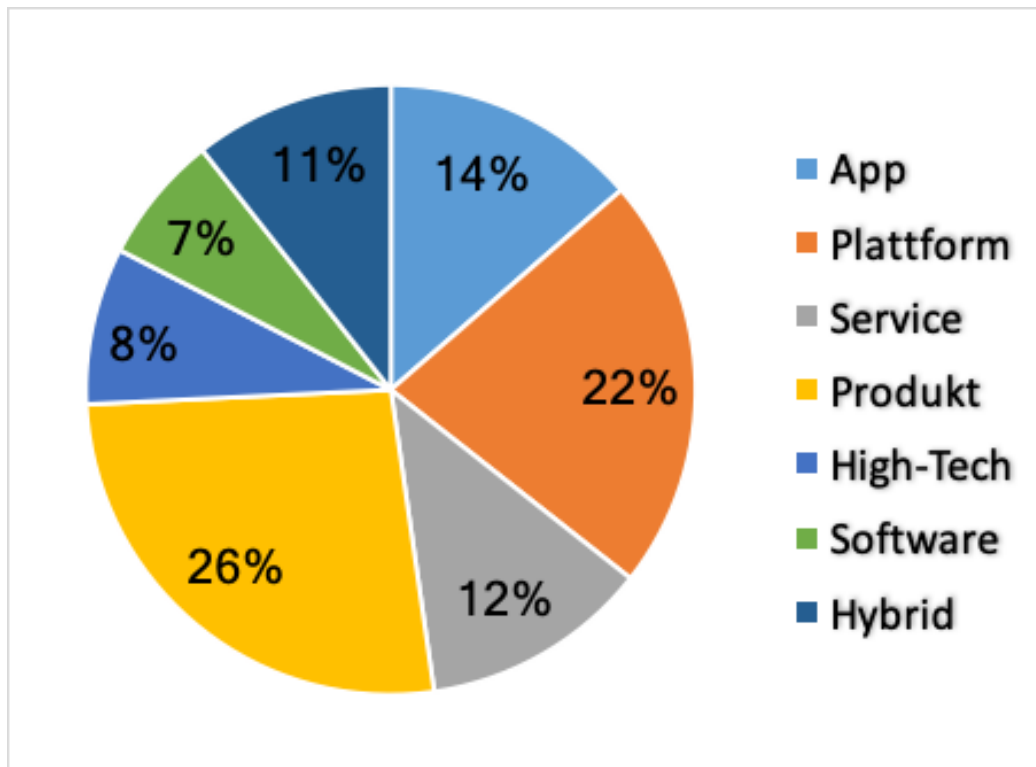


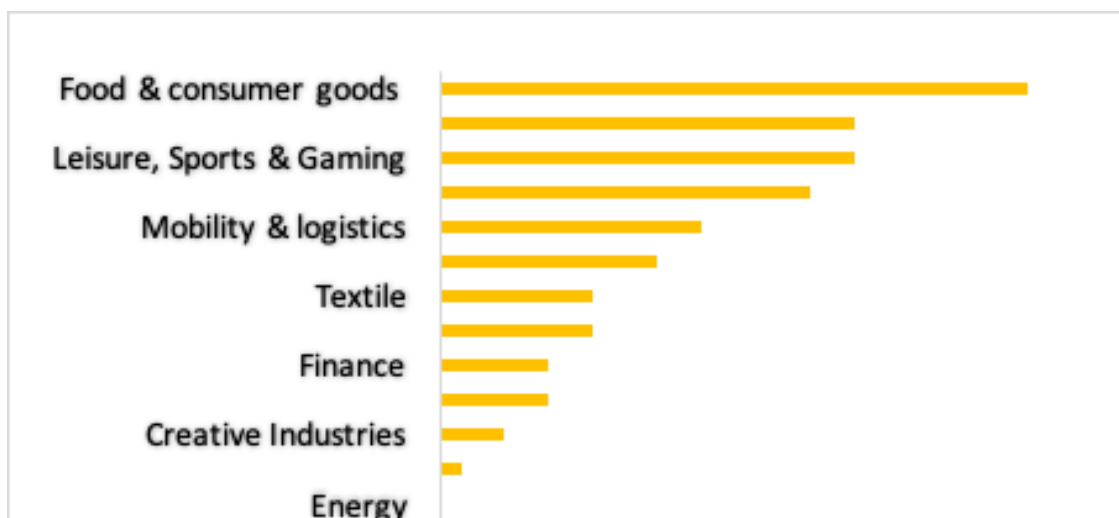
Figure: Distribution of students among the finalists in percent

In general - both as a result of competition and other initiatives - an increased networking of universities in Baden-Württemberg can be observed. The award ceremony was hosted by the Ministers Theresia Bauer (Ministry of Science and Art) and Nicole Hofmeister-Kraut (Ministry of Economics). The programme and thus the competition is to be further developed as part of the state campaign Start-up BW with the aim of making it more consistent. In addition, the design of supplementary materials, an English-language version and networking with the local innovation ecosystems is the goal of the next project phase.

Looking at the dates from the first 300 teams this provides an interesting overview about the kind of solutions and approaches students picked towards finding product-market and later business model fit:



This corresponds to some extent with Food&Consumer Goods as well as leisure, sports & gaming being overrepresented.



### Implications for practice

The program offers a great transfer potential - within universities and colleges in Baden-Württemberg but also beyond. It can be expanded throughout Germany or even used internationally. There is also interest in application by companies in formats such as an internship semester as “Entrepreneur in Residence”. The approaches and methods can be used independently of subject areas in teaching and conception in the field of innovation management or corporate entrepreneurship. Additionally, companies can be integrated as mentors. In the lecture the competition process including the playbook will be presented as well as possibilities to integrate the competition into the teaching and together we will discuss the hypothesis if this approach can motivate more women to take the next step in the founding process.



# **SESSION 4A**

## **Printing Technology**



## The influence of certain characteristics of screen printing plates and inks on deposition of ink coatings on anodized aluminum substrates

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### Keywords

Screen printing, printing plates, printing inks, aluminium substrate.

### ABSTRACT

Screen printing is a printing technique widely used for variable applications (textile printing, special effects, printed electronics etc.) and it can be used for application of different technical coatings on various substrates. The quality of reproduced image depends on properties of used printing plates, properties of substrates and on the printing process. Among the various types of printing substrates for special or external applications, aluminium has gain a great interest due to its superior decorative, fashionable design appearance and unique properties. In the present study, the printability of aluminium with respect to printing conditions in screen printing technique was investigated. In particular, AA1050 alloy specimens were chemically pretreated and anodized, thereby affecting the surface morphology and properties of the printing substrate. Three types of printing plates with different meshes and printing inks of different compositions were used in printing process. Measurements of contact angles and calculations of surface free energy were performed for the analysis of the aluminium samples. The properties related with the thickness and morphology of the printed coatings, as well as the optical density and CIELab values, the light fastness and adhesion of the prints were observed. The results showed that a) the aluminium alloy has similar amount of polar and dispersive components of the surface free energy with a slightly higher amount of dispersive component; b) different compositions of printing inks cause a slightly different adsorption of ink coatings on aluminium substrate and c) the usage of the printing plates with different meshes has a great influence on the thickness of the printed coatings. One can conclude that the improvement of the quality of the imprints, especially for outdoor and other demanding specific applications could be achieved by pretreatment of aluminium substrates under the applied conditions in relation to the selected composition of the printing inks and types of printing plates described in this study. The scientific outcomes that concern the influence of printing parameters combined with the morphology (thickness, porosity, etc.) of aluminum substrate on print quality and properties of imprints may be combined with further practical applications in the field of printing technology.

### Flexographic printing with carbon nanomaterials

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## Keywords

Graphene, Conductive Inks, Flexographic Printing, Printing substrates

## ABSTRACT

In recent years, due to the evolution of the nanotechnology, printing has regained considerable attention by different point of view, this of the printing electronics on flexible substrates such as paper. Thus, there is a tremendous interest in research community for functional-printing materials (conducting, semiconducting, dielectric materials etc) as active pigments for printing inks. Up to now, commercial conductive inks are based on silver nanoparticles, carbon black or graphite and conductive polymers which lack off high cost and time-consuming processes. As a result, significant effort has been devoted to conductive materials and especially solution processed graphene derivatives. Printing with carbon nanomaterials has been recognized as an excellent approach for development functional devices.

In this paper, we present the formulation and printability of a water-based conductive flexographic printing ink based on a highly dispersible in water graphene/multiwall carbon nanotube hybrid (G/MWNT-f-OH). Catechol functionalized multiwalled carbon nanotubes exhibit high hydrophilicity and offer significant stability to the usually hydrophobic graphene nanosheets dispersed in water. Therefore, a mixture of these two carbon nanomaterials can be considered as a water based all carbon hybrid with high electrical conductivity. For the preparation of ink formulation, an under-development water-based resin emulsion suitable for absorbent substrates was used and the ratio of total solids, carbon/resin in the final ink was 60/40. The printing ink was fully characterized by various analytical methods. Microscopic analysis was performed using Scanning Electron Microscopy, electrical measurements were performed using a 4-point probe system and a Keithley 2400 Source Meter and rheological measurements using a rotational rheometer (Malvern Kinexus Pro+) adapting a cone and plate geometry. The flexographic printing tests of the conductive ink were carried out on various papers (coated and uncoated) using the IGT F1 printability tester and a specially designed flexo plate. The sheet resistance of the as prepared ink was below 100 Ohm/sq. The best results were obtained when standard IGT substrate and smart paper type-2 were used. Pre-inking increased the print density of the printed samples while the time between pre-inking and print was critical because of ink drying. It was found that the anilox volume has dominant effect and affects ink film thickness. Print density was found to be increased as the anilox volume increased. Printing pressure and printing speed had no significant effect on the print quality. The as prepared conductive ink had comparable printing quality with the conventional commercial ink.

## Acknowledgments

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## Experimental research on book-edge trimming by circular knife with eccentric blade movement

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## Keywords

Eccentric disk knife, book-edge trimming, cutting speed, cut quality

## ABSTRACT

The paper deals with experimental research of the book-edge trimming using eccentric disk knives. The original test stand was designed and manufactured. It made possible to carry out experimental studies of a stopless method of book-edge trimming and analyze the impact of technological parameters of cutting with an eccentric disk knife on the power and quality of the books processing. Practical possibility to use eccentric disk knives for non-stop book-edge trimming from three sides has been proven. Book-edge trimming by eccentric knife can reduce the cutting force by about one half

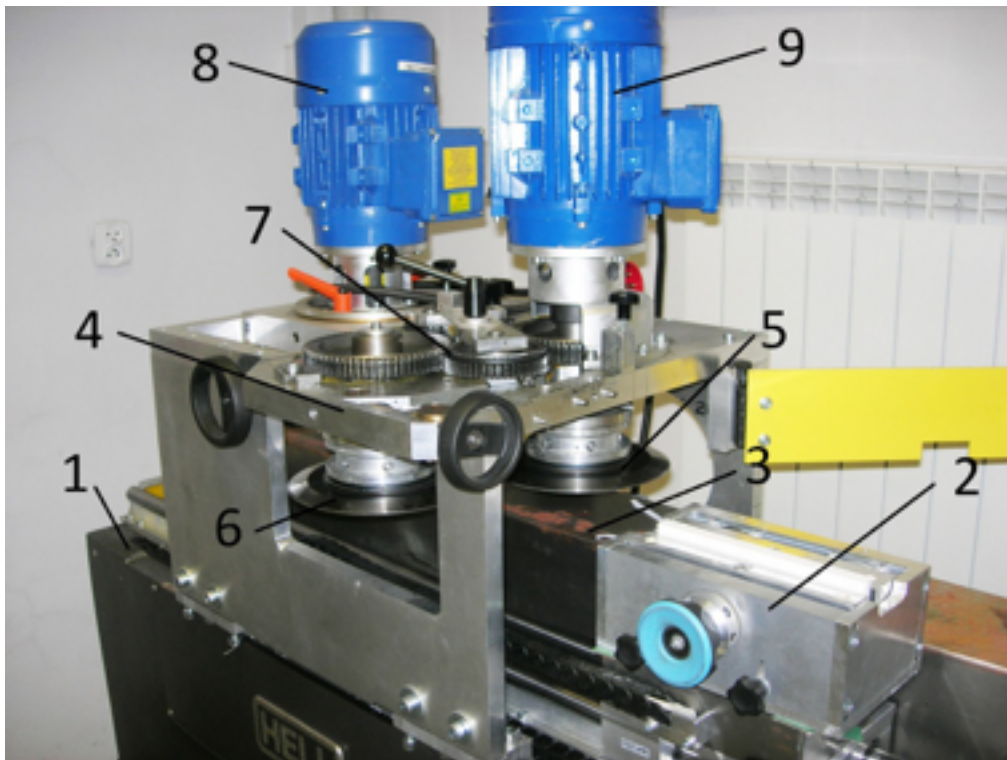
with high cut surface quality if compared with traditional disk knife. The eccentric cutting features were revealed, and the positive effect of the intermittent cutting on the efficiency of the processing of books was confirmed due to reducing of the actual cutting angle, the impulse effect of the knife blade on paper and the sparing conditions of the blade movement, compared to the traditional knife.

## **1. Introduction and background**

In our previous work (Piotr Janicki, Georgij Petriaszwili, Sergey Komarov, 2016) and (Piotr Janicki, Georgij Petriaszwili, 2017) we studied kinematics of book-edge trimming with circular knife and proposed to use eccentric installation of the knife. During the investigation, mathematical description of the interrupted and contiguous cutting was established. After mathematical modelling of the eccentric blade trajectory while cutting, we found out, that the cutting process might be realized in two different modes. They are: continuous cutting and interrupted (impulse) cutting. Both modes are possible by synchronous cutting as well as by anti-synchronous cutting. By the continuous cutting, knife's blade is in constant contact with the paper during the processing. Impulse cutting occurs when the knife's blade comes out of contact with the book paper in a certain phase of the knife rotation cycle - at this point, the cutting process interrupts, and the edge of cutting knife does not touch the part of the book-edge during certain period of time. (Janicki P., Petriaszwili G., Komarov S., 2017, 2019). Also we investigated cutting process parameters and conditions which cause the trimming to be continuous or impulse (G.Petriaszwili, P.Janicki, S.Komarov, 2019). We presumed the impulse cutting to be more efficient due to reduction of the actual sharpening angle and therefore reduction of cutting force and due to better cooling of the knife's blade (G.Petriaszwili, P.Janicki, S. Komarov., 2020). In order to verify the formulated scientific hypothesis about two modes of cutting: continuous and interrupted ones, as well as to check the theoretical results regarding the influence of kinematic parameters on cutting process flow, an experimental research was carried out.

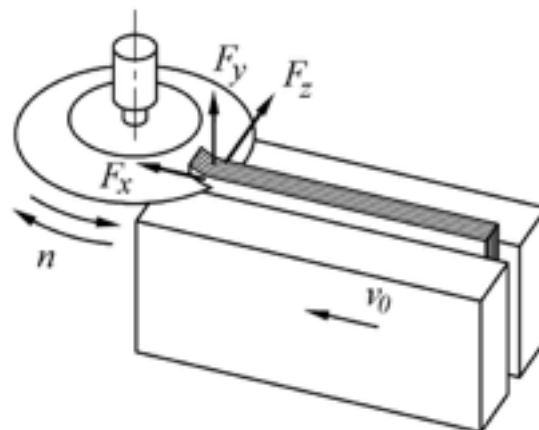
## **2. Materials and Methods**

A special laboratory stand was designed and built with a drive unit for transporting of book blocks at different speed, and a rotary cutting unit equipped with circular knives (Fig.1). The motor installed on the stand base (1), through the worm gearbox and the toothed belt (3) moves a carriage (2), in which the clamped block is fed to the cutting zone. An electronic control system having three frequency converters to control the motors of carriage drives and disk knives, allows you to adjust the feed and rotation speeds. The cutting unit (4) is located above the carriage guides, and consists of a special driving mechanism (7) for two disk knives (5.6), which are driven by the motor (9), and the motor (8), which rotates third circular knife. The knife is fastened directly to the motor's shaft.



*Figure 1: Special laboratory stand for investigating of book-edge trimming with eccentric circular knives*

The experimental stand allows to set one or more knives with an autonomous drives sequentially, and conduct a study of book blocks trimming having length up to 240mm, thickness up to 30mm at a feed rate up to 2 m/s and rotational speed of knives up to 3000 rpm. The eccentricity of knives can be smoothly regulated from 0mm to 3mm. Knives with a diameter of 200mm and a sharpening angle of  $26^\circ$  were used for experiments. The movable transport carriage is equipped with a special dynamometer located inside. It measures the three components of the cutting force when trimming book blocks (Fig. 2).



*Figure 2: A principal scheme of measuring three components of cutting force*

A National Instruments (USA) data acquisition system was used to register and analyze fast-changing signals. Enhanced data acquisition system enables simultaneous recording the process of cutting books of the following parameters: three components of cutting force, clamping force, three components of knives vibrations together with spectral analysis and measurement of knife blade wear. The measuring path of the acquisition system consists of three basic blocks: measuring, signal processing and analyzing block. Registration and analysis of signals takes place in a PC computer using

specialized programs LabVIEW SignalExpress and DIAdem (National Instruments). Investigation of the influence of each variable parameter to the cutting process was carried out with the established basic values of other processing parameters. The variable parameters were: feed rate (0,25..1,5m/s), rotation speed of the knife (750...2000rpm), direction of rotation (synchronous/anti-synchronous), distance of the book block from knife's axis of rotation (0..80mm), eccentricity size (0..2mm), book block thickness (5..15mm), book block length (100..240mm). Constant parameters were: disk knife diameter (200mm) and its sharpening angle (26°). Some tests were carried out for different paper types, but in most experiments the offset paper 70 g/m<sup>2</sup> was used.

### 3. Results and Discussion

#### 3.1 Analysis of components of cutting force.

The full cutting force of the book block can be measured in the form of three components: the horizontal one  $F_x$  - acts in the cutting plane in the direction of transportation of the block, component  $F_z$  – acts in perpendicular direction of transportation in the cutting plane, and vertical component  $F_y$  - perpendicular to the cutting plane (Fig.2). As a result of the research, a very small value of  $F_y$  component was recorded compared to other components (Fig. 3), therefore, the main attention was paid to the study of forces that arise in the plane of cutting, that is, by analyzing  $F_x$  and  $F_z$  components and their sum .

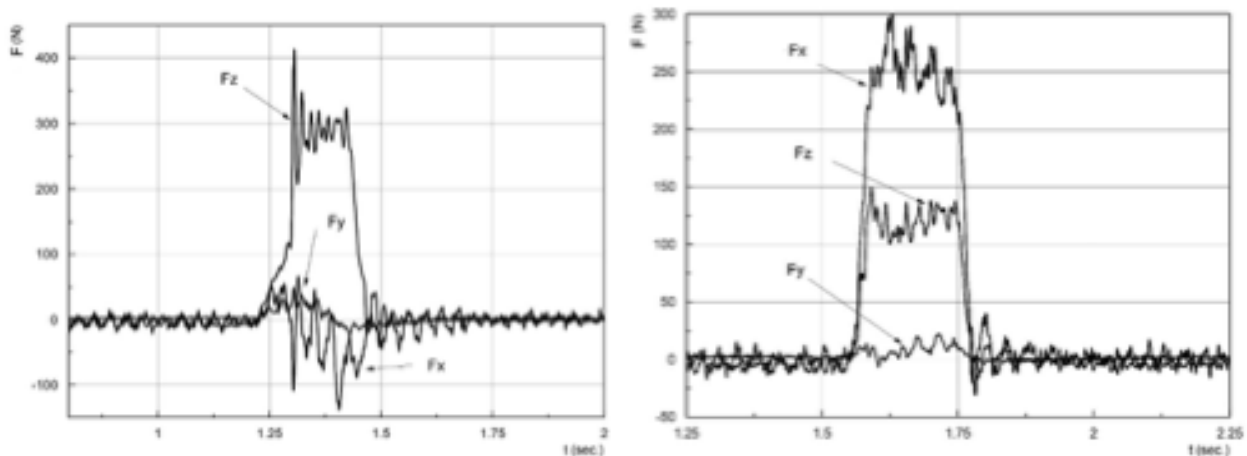


Figure 3: Typical oscillograms of the three components  $F_x$ ,  $F_y$  and  $F_z$ , measured on the carriage. Left diagram - anti-synchronous cutting, right diagram – synchronous cutting

Layout of cutting force components in the cutting plane because of the processing of the book block in alternative form is shown in Fig. 4. In the common theory of cutting, they use two components of the cutting force  $F$ : normal force  $F_n$  - the reaction of the knife on the book block during cutting and a tangent force  $F_t$  - the rotating knife reaction to the load, caused by paper sawing and friction. The forces  $F_n$  and  $F_t$  act in the plane of cutting and perpendicular to each other. The resulting force  $F$  is their geometric sum. Normal and tangent components can't be measured directly, but they can be easily obtained from the measured components  $F_x$  and  $F_z$ .

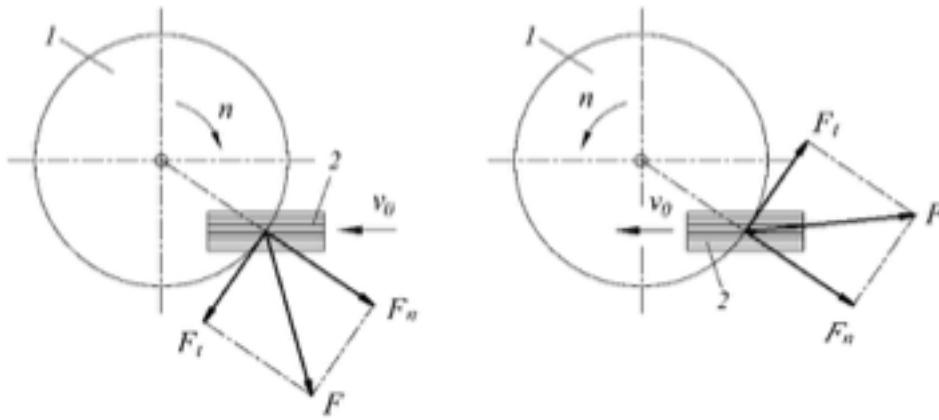


Figure 4: Components of the cutting force. 1 – disk knife, 2 – book block.

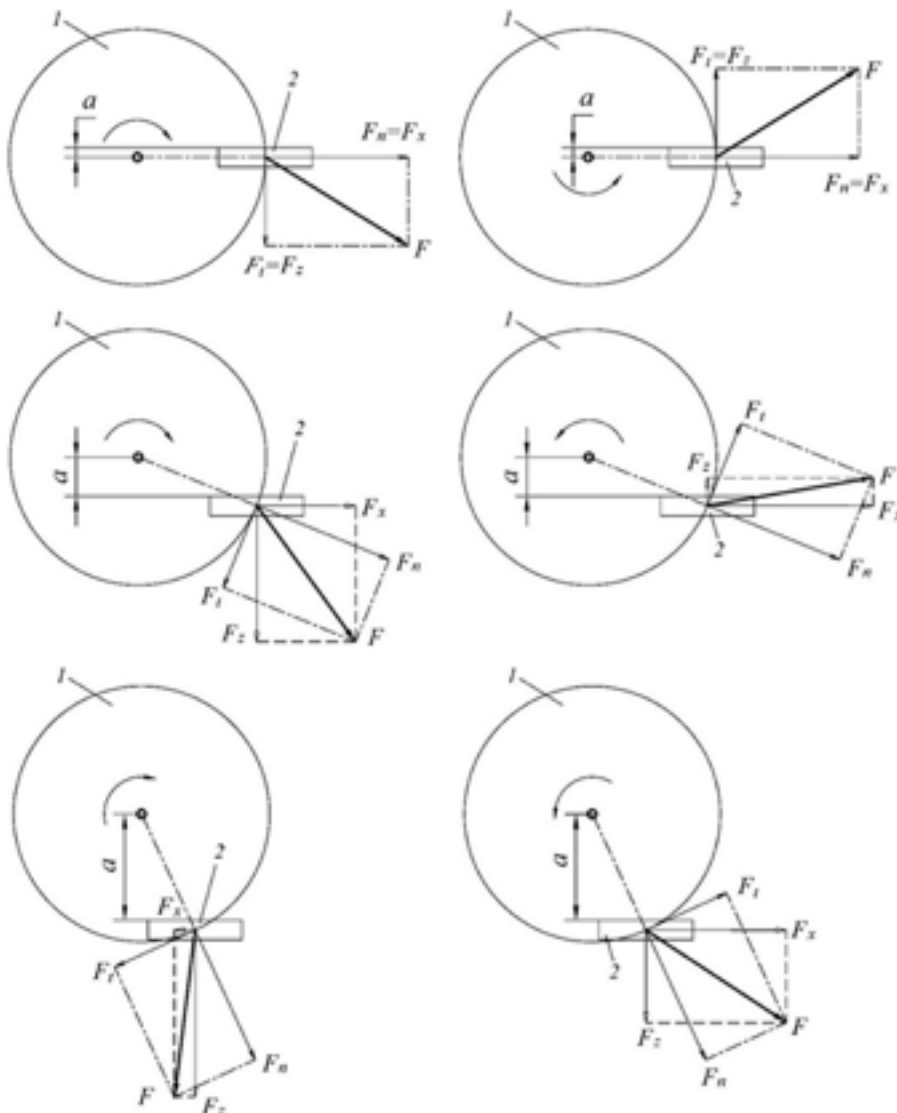


Figure 5: Changing the direction of the components of the cutting forces depending on the position of the block. 1 – disk knife, 2 – book block. Left – synchronous cutting, right – anti-synchronous cutting.

Depending on the position of the disk knife (the distance between the axis of rotation of the knife center and the block top side) and the direction of rotation of the knife, the value and direction of  $F_x$  and  $F_z$  components are changing. Fig.5 shows some possible variations of their changing. The component of the  $F_x$  arises as a result of cutting of clamped paper and acts in the opposite direc-

tion of book block feed. Negative value of the  $F_x$  component is possible by synchronous cutting at the maximum distance between the block and the knife's center. In this case the  $F_x$  component "supports" the block feed during its cutting. Changing the direction of the  $F_z$  component with an increase of the distance between the knife and the block was noted for synchronous cutting. After analyzing the oscillograms, it was found that the cutting force for book blocks trimming is lower by anti-synchronous cutting than by synchronous cutting. It is consistent with the results of kinematic analysis of a disk knife actual sharpening angle transformation. Also the hypothesis about existence of two cutting modes (contiguous cutting and impulse cutting) when using eccentric knife has been proved. Fig. 6 presents the experimental plots of recording the component  $F_x$  of cutting force during the anti-synchronous cutting of book blocks with an eccentric circular knife

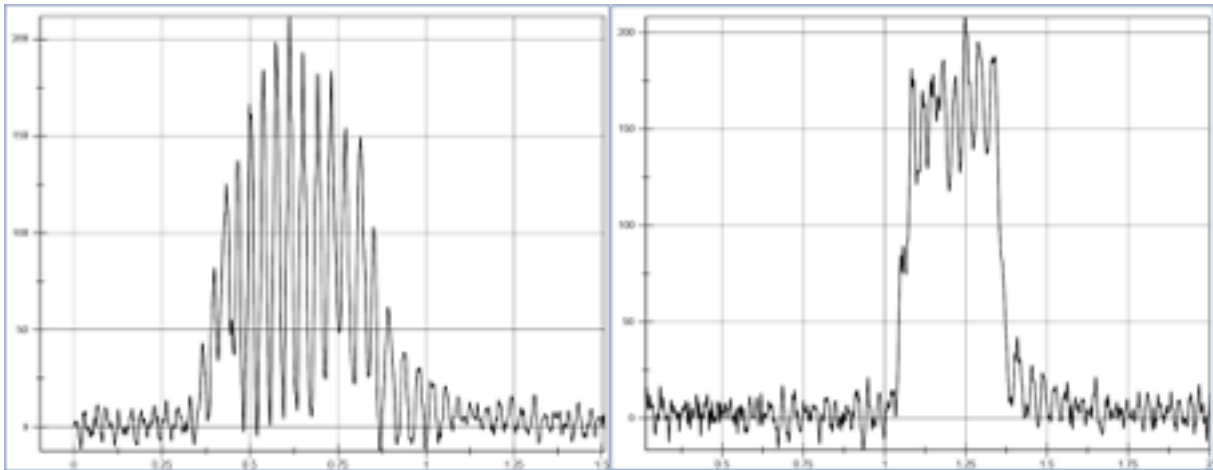


Figure 6: Changes of  $F_x$  component of cutting force during trimming the book with an eccentric circular knife ( $e = 1 \text{ mm}$ ). Left – interrupted cutting, right – contiguous cutting.

In the interrupted (pulse) cutting mode, the force on the knife drops practically to zero when the blade is detached from the paper and increases again from the moment the knife's cutting edge comes into contact with the book's paper (Fig.6, left). Cyclical fluctuations and a decrease in the average values of the actual cutting angle as well as the dynamic nature of the interaction between the knife blade and the paper result in a reduction of the processing forces. The intermittent nature of the cutting also increases the efficiency of the processing with the circular knife by reducing the temperature in the cutting zone, due to the periodic lack of contact between the cutter blade and the paper being cut. In the continuous cutting mode, cyclic fluctuations in the value of the  $F_x$  component of the cutting force with an eccentric knife are noted. However, due to the higher feed speed of the book, the knife blade cannot keep up with the contact with the paper being cut and the nature of the cutting force changes on the experimental plot is different than in the case of interrupted cutting. Impact of the trimming process parameters on the cutting force is identical for contiguous and interrupted cutting.

### 3.2 Impact of book-edge trimming process parameters on cutting force

Experimental tests conducted on a laboratory stand, allowed to explain the degree of influence of various parameters for processing a book block to the value of the force components and the resulting force of cutting. The research was carried out taking into account the parameters of the process that had maximum impact on the cutting force. Measurements were performed sequentially for each test. Only one parameter was variable with selected constant values of other parameters of the cutting process. The results of measurements were taken from oscillograms. Each measurement was carried out at least three times. Main results are shown in the graphs below. There is information about processing parameters for testing for this series of cutting in the signature under the each graph.

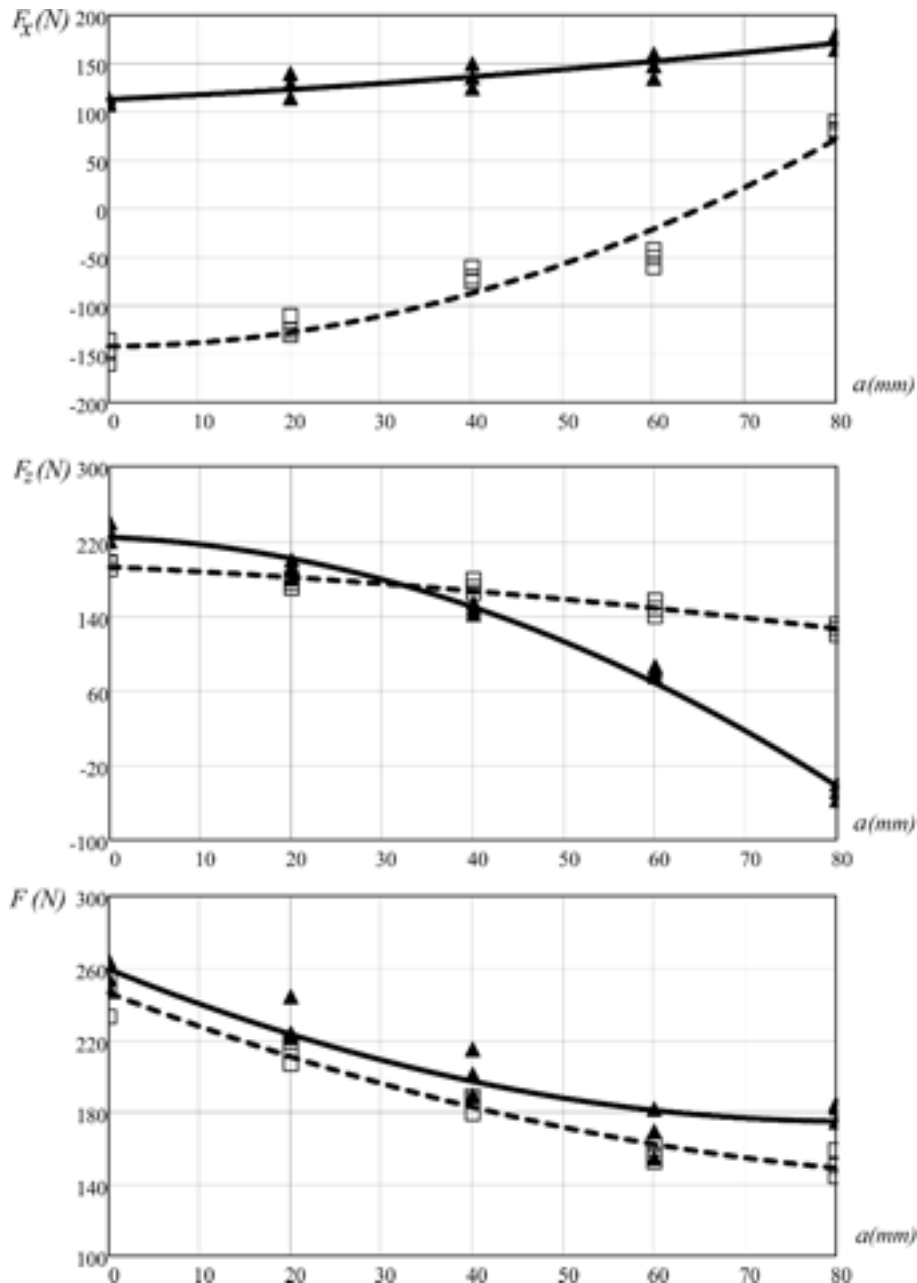


Figure 7: Values of components  $F_x$ ,  $F_z$  and full force  $F$  depending on the distance of the block from the axis of rotation of the disk knife  $a$

Dashed line – anti-synchronous cutting; Solid line - synchronous cutting.

Cutting parameters: knife diameter  $D = 200$  mm, sharpening angle  $\alpha_0 = 26^\circ$ , rotation speed of the knife  $n = 1800$  rpm, book block feed rate  $v_0 = 0,5$  m / sec, eccentricity  $e = 0,5$  mm,

Book block height  $H = 15$  mm, Book block length  $l = 100$ mm, offset paper  $70g / m^2$

As a result of the conducted research, it was found that the direction of rotation of the knife significantly affects the change in the direction of the  $F_x$  and  $F_z$  components and their maximum values. In case of synchronous cutting and installing a knife at a maximum possible distance  $a$  from the book block, a change in the direction of the longitudinal component  $F_x$  noticed, due to which the value of the feed force is reduced (Fig. 7). By anti-synchronous cutting there is a change in the direction of  $F_z$  force. It turned out that the complete force of cutting by both synchronous and anti-synchronous cutting reduces with an increase in the distance of the book block relative to the axis of rotation of the knife.



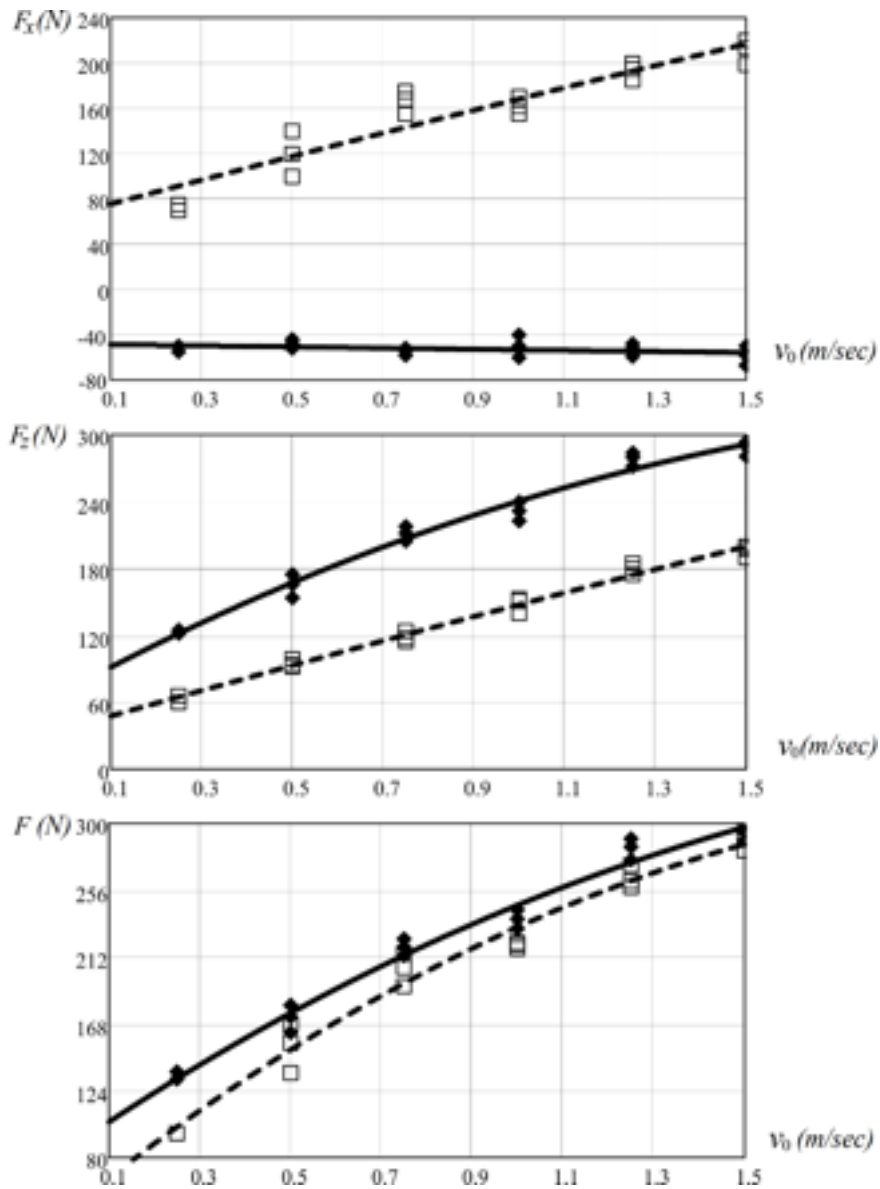


Figure 8: Values of components  $F_x$ ,  $F_z$  and full force  $F$  depending on the block feed rate  $v_0$ . Dashed line – anti-synchronous cutting; Solid line - synchronous cutting. Cutting parameters:  $D = 200$  mm,  $\alpha_0 = 26^\circ$ ,  $n = 1800$  rpm,  $v_0 = 0,5$  m / sec,  $e = 0,5$  mm,  $H = 15$  mm,  $l = 100$ mm, offset paper  $70g / m^2$

It has been found that by increasing the feed rate  $v_0$  from  $0,25$  m / s to  $1,5$  m / s (at a rotational speed of  $1500$  rpm), the  $F_x$  component increases in  $2,5 \div 2,8$  times for anti-synchronous cutting. It practically does not change its value for synchronous cutting. With an increase in the feed rate, the component of the  $F_z$  force grows more intensive for anti-synchronous cutting, by  $3 \div 3,3$  times, and for synchronous cutting - by  $2,3 \div 2,4$  times (Fig.8). The resulting force of cutting  $F$  increases by approximately  $2,3 \div 2,9$  times for all directions of rotation of the knife. The full cutting force  $F$  always has approx.  $10..15\%$  smaller value for anti-synchronous cutting than by synchronous one. It is consistent with our theoretical researches regarding the transformation of the sharpening angle, which has direct impact on the cutting force.

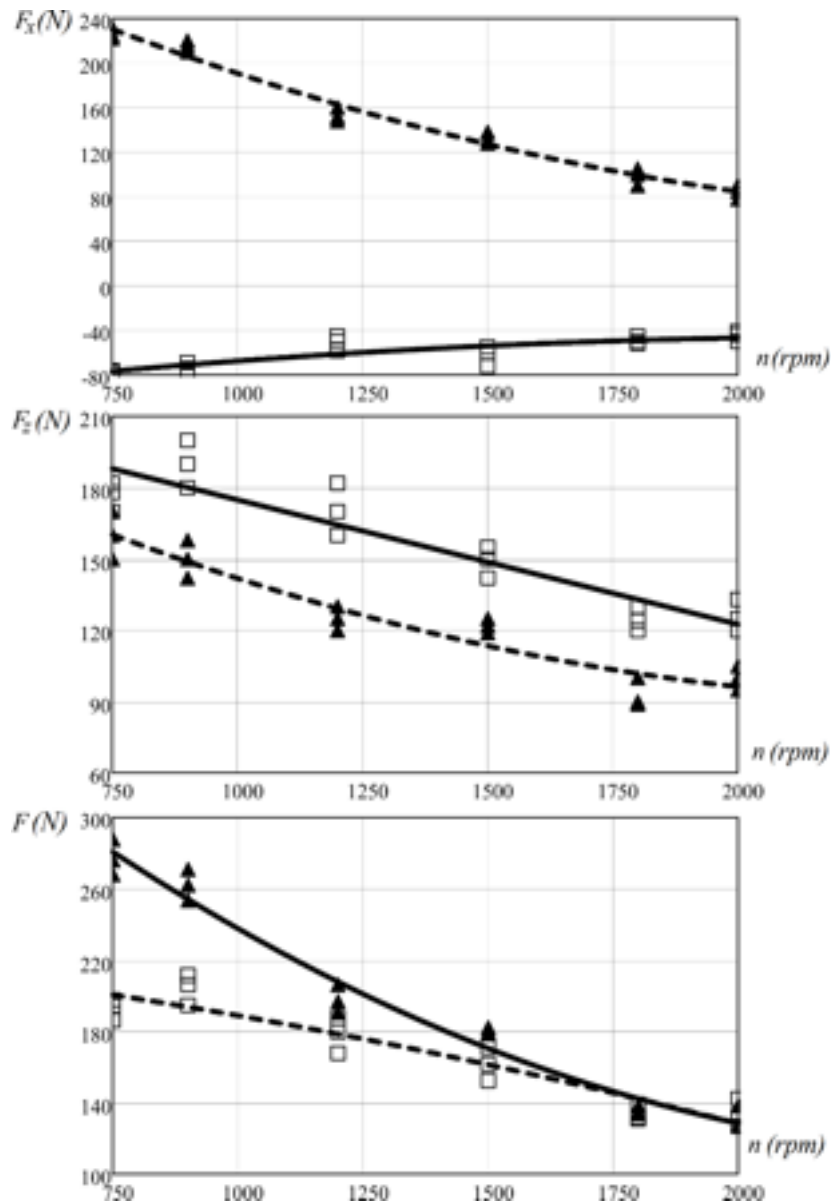


Figure 9: Values of components  $F_x$ ,  $F_z$  and full force  $F$  depending the rotating speed of the knife  $n$ . Dashed line – anti-synchronous cutting; Solid line - synchronous cutting. Cutting parameters:  $D = 200$  mm,  $\alpha_0 = 26^\circ$ ,  $n = 1800$  rpm,  $v_0 = 0,5$  m / sec,  $e = 0,5$  mm,  $H = 15$  mm,  $l = 100$ mm, offset paper  $70\text{g} / \text{m}^2$

Fig. 9 shows graphs of impact of the direction and speed of rotation of the knife on the components and the full force of book blocks cutting. Increasing the speed of the knife demonstrates a tendency to reduce all components and the resulting cutting force. The most significant influence of the rotational speed of the disk knife on the value of the  $F_x$  component was noted for anti-synchronous cutting. Thus, an increase in the speed of the knife rotation from 750 rpm to 2000 rpm reduced the value of the  $F_x$  component of about 2,8 ÷ 3,0 times. Such an increase in the speed of the knife reduces the resulting cutting force by approximately 1.4 ÷ 2.1 times. However, with a further increase in the speed of rotation (more than 3000 rpm), burning of the surface of the cut block was noted, even be clock feed rate over 1.0 m / s. It was also noted that when an eccentric installation of a knife  $e = 0.5 \div 1$  mm at a rate of 1500 ÷ 2000 rpm, the burning of block surface was absent at the feed rate  $v_0 = 0,25$  m / s. It proves a beneficial effect of the impulse cutting mode to reduce heat production in the cutting zone.

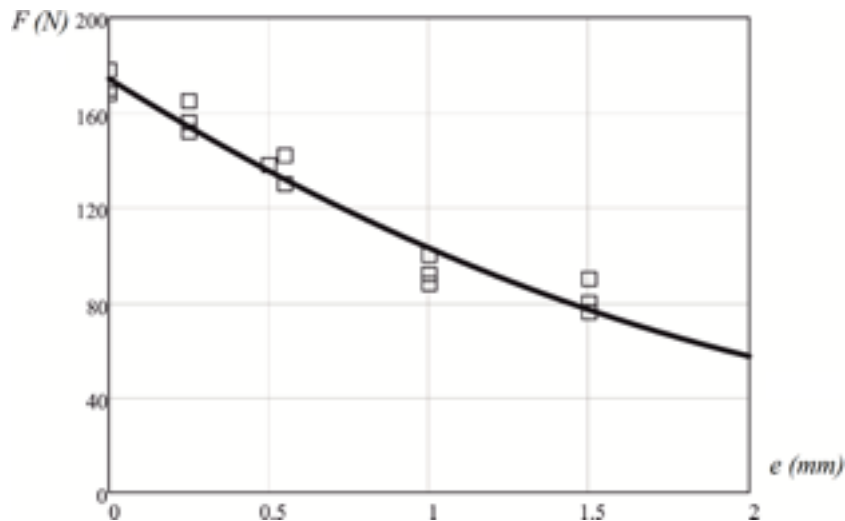


Figure 10: Influence of the eccentricity value  $e$  on the component  $F_x$  (the force of feeding the block) with anti-synchronous cutting

Cutting parameters:  $D = 200 \text{ mm}$ ,  $\alpha_0 = 26^\circ$ ,  $n = 1800 \text{ rpm}$ ,  $v_0 = 0,5 \text{ m/sec}$ ,  $e = 0,5 \text{ mm}$ ,  
 $H = 15 \text{ mm}$ ,  $l = 100 \text{ mm}$ , offset paper  $70 \text{ g/m}^2$

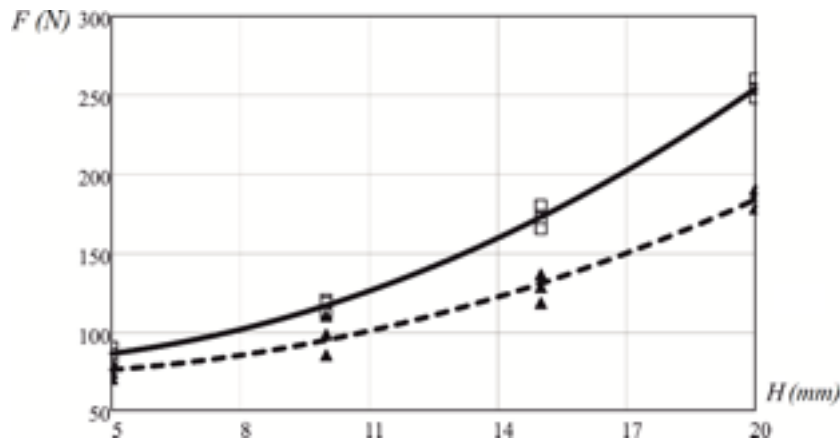


Figure 11: Influence of the book block thickness  $H$  on the value of the full horizontal cutting force  $F$   
Dashed line – anti-synchronous cutting; Solid line - synchronous cutting.

Cutting parameters:  $D = 200 \text{ mm}$ ,  $\alpha_0 = 26^\circ$ ,  $n = 1800 \text{ rpm}$ ,  $v_0 = 0,5 \text{ m/sec}$ ,  $e = 0,5 \text{ mm}$ ,  
 $H = 15 \text{ mm}$ ,  $l = 100 \text{ mm}$ , offset paper  $70 \text{ g/m}^2$

Fig. 10 shows a graph of impact of the eccentricity value  $e$  of a disk knife for the  $F_x$  component for anti-synchronous cutting. Analyzing this graph, it can be concluded that with an increase in eccentricity from  $e = 0,25 \text{ mm}$  to  $e = 2 \text{ mm}$ ,  $F_x$  component decreases by about  $2 \div 2,15$  times. With a further increase in the value of the eccentricity  $e$  up to  $3 \text{ mm}$ , the  $F_x$  component is slightly decreasing, while the tests have discovered significant vibrations of the system of the knife drive and the base of the test stand, so recording of the signals of the cutting force was impossible due to significant vibration of sensors. Investigation of the impact of the value of the eccentricity of the knife on the feed force  $F_x$  showed that it is possible to reduce the component  $F_x$  by approximately  $1,3 \div 1,9$  times by anti-synchronous cutting and eccentric size within the range  $e = 0,5 \div 1 \text{ mm}$ . It enables qualitative trimming of book-edges without causing excessive vibrations of the cutting system and surface burning. Fig.11 shows the graphs of the impact of the thickness of the book block on the value of the components of the cutting force:  $F_z$  and  $F_x$ . With an increase in the thickness of the block there is a nonlinear increase of the actual line of collision of knife blade with a cut block. It causes a nonlinear increase of cutting force. The tests showed that with an increase in the thickness of the block from  $5 \text{ mm}$  to  $15 \text{ mm}$ , component  $F_z$  and  $F_x$  increased by  $1,7 - 2$  times. Further growing in the thickness of

the block led to further increase in force and a significant degrading of cutting quality, regardless of the direction of the knife rotation. As a result of research, it has been found that to provide quality cutting the maximum thickness of the book block height should not exceed 15 mm.

#### 4. Conclusions

The discussed experimental researches confirmed the previous theoretical investigations regarding the contiguous and impulse cutting modes as well as possible influence of cutting parameters on the cutting force of book-edge trimming with eccentric disk knives. The following work parameters of the trimming process are recommended: the speed of rotation of the knife  $n = 1500 \div 2000$  rpm; eccentricity of knife  $e = 0,5 \div 1$  mm; diameter of knife  $D = 200$  mm; angle of knife sharpening  $\alpha_o = 26^\circ$ ; block feed rate  $v_o = 0,2 \div 0,5$  m/sec (for impulse cutting) or  $v_o = 0,5 \div 1,5$  m/sec (contiguous cutting). Anti-synchronous cutting along with setup parameter  $a = 75 \div 80$  mm provide high quality cutting of book blocks with a thickness of up to 15 mm. The conducted studies have demonstrated the practical possibility of using eccentric circular disk knife for cutting book blocks with high rates of feed and allowed to optimize cutting parameters to use new cutting systems in streaming lines.

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#### Application of conductive ink to inspect lapm performance in lamp packaging

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## Keywords

Conductive Ink, PEDOT:PSS, Electrical Resistivity, Lamp Packaging

## ABSTRACT

The objective of this research aimed to develop the lamp packaging capable of testing the malfunction of LED lamp in the package. This lamp packaging would be helpful for the buyers to be able to inspect the lamp before making a purchase. The conductive ink were prepared with composition of poly (3,4- ethylenedioxythiophene):polystyrenesulfonate (PEDOT:PSS) used as conductive material, dimethyl sulfoxide (DMSO) used as solvent with low resistance properties, ethylene glycol (EG) and triton x-100 used to improve the viscosity and surface tension of the conductive ink. The experiments were analyzed for the optimum proportions of conductive ink printed on Polyethylene Terephthalate (PET) film that give lowest electrical resistivity (highest electrical conductivity). The concentration ratio of PEDOT:PSS: DMSO: EG: triton x-100 varied from 45:50:4:1 to 90:5:4:1 and printed on the PET substrates by inkjet printing. The electrical resistivity values of all conductive samples were tested by using direct current circuit, LabVIEW software and a NI USB DAQ 6008 device on laptop computer. Surface topography and grain characteristics of conductive ink printed samples were also investigated by Scanning Electron Microscope (SEM) with 60,000 X magnification.

The result showed that the amount of PEDOT: PSS increased, the electrical resistivity decreased that means the electrical conductivity increased. The optimum concentration ratio of PEDOT:PSS:DM-SO:EG:tritonx-100 that giving highest electrical conductivity was 75:20:4:1. It was also found that this ratio gave small grain of PEDOT:PSS and charge carrier holes moving freely.

The Light Emitting Diode (LED) lamp packaging was designed and developed to apply conductive ink with the optimum proportion ratio printed on PET substrate as the function inside the package structure. Two internal structural parts were added; part 1 used as lamp holder and protecting the lamp during transportation and part 2 used to inspect the function of the lamp by conductive ink printed as electrical circuit panel. It was found that normal LED lamp in the package can illuminate when pass electricity through the package. Therefore, PEDOT: PSS conductive ink can be applied in the printed structure of lamp packaging to test the performance of the lamp without taking it out of the package.

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## **SESSION 4B**

# **Printing and Packaging Technology**





## **Image-based techniques, a new approach on the study of historical print materials. The case of the ASPIOTIS Greek printing industry during the start of 20th century.**

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### **Keywords**

Postal cards, printing graphic artworks, conservation of archive materials, multispectral microscopic imaging, computational image analysis.

### **ABSTRACT**

The graphic art firm ASPIOTIS was the first and the largest graphic art industry in Greece since the last quarter of the 19th century. After the death of Gerasimos Aspiotis who was the founder of the firm, his sons, Konstantinos, firstly, and after with Nikolaos, took over the management of the company. Konstantinos Aspiotis studied in three different European countries (Austria, France and Switzerland) and he worked in London as Director in a British company. Thus, the small playing card printing factory became a competitive industry of European proportions. Under this aspect, when he returned in Greece and he took over the ASPIOTIS, he imported innovation techniques in printing of graphic artworks.

The aim of this study is first of all to present some series of postcards that were created during the first period. Another issue of the study is to retrieve information about the process and techniques that had been used by ASPIOTIS to produce postcards of such high quality.

The company ASPIOTIS, during the first period of the administration of Aspiotis' brothers, printed a series of postcards that were reproductions of works of art by well-known Greek artists of the time, who painted works of art, specifically for this purpose. Today, many of these postcards are kept in the Historical Archive of the National Bank of Greece, as well sample books containing postcards, posters with similar themes, and some paintings that were created for this purpose.

Digital image-based techniques were applied on the postcards in order to retrieve the traces of the graphic printings used in the postcards' creation. These digital techniques consist of microscopic texture observations at different magnifications and at different wavelengths of the electromagnetic spectrum. These observations can give us information related to the printing techniques based on the printing texture. Moreover, the contemporary digital process into the graphic arts production leads the old production techniques to the oblivion and so significant parts of the graphic art evolution can be lost. Both the retrieved historical information and the microscopic printing textures allow, firstly, the contemporary graphic arts industry to reproduce these works on better terms and, secondly, the historical research to enrich its knowledge about the production of historical graphic artworks. Also, the comparison of these two aspects, historical information and image-based techniques, can give us information not only related to the manufacture techniques of postcards found in the Historical Archive of the National Bank of Greece, but also allow to determine the day of entry of these postcards.

### **Security printing innovation**

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## Keywords

Security printing, security printing elements-graphics, Infraredesign, colour twins, individualised security graphic

## ABSTRACT

Security printing, is constantly demanding continuing innovations in order to introduce adequate additional value to print-media “products” in the fight against forgery. In this paper we introduce the innovations that are result of intensive - advanced research on security printing elements, also referred as security graphics and s concerning the implementation on printed matters, documents and packaging.

Security printing elements - graphics include various elements, such as individualised vector line graphics, rosette, guilloche, linear and hidden typography and as well individualised raster elements. These elements, are dedicated for design and production in various different printing and finishing processes applied as per example: intaglio print, offset, folio print, digital print, screen printing, hot stamping, etc.

A common procedure in security printing is the application of hidden information, realized through the so-called “hidden” typography, vector graphics and pixel graphics in extended spectrum, from visual (400-700 nm) to near infrared spectrum (700-1000 nm). In particular, security printing elements are designed for usage in several spectral areas from UV (254 nm, 365 nm), through visual (400-700 nm) up to near infrared spectral area (700-1000 nm).

Hidden security typography is implemented into the individualised raster graphics and inside the raster element itself. Design of the double graphics in the shape of individualised raster is the result of the long years of development and innovation in the field of security graphics and design of individualised raster elements.

One of the most prominent innovation is Infraredesign, which, in principle enables the incorporation of a hidden picture appearing only in near infrared spectrum, in the four colour printing process and inks. Typography in the Infraredesign process is projected as hidden message through the programmed designer’s composition or structure. It is realised also through the twin dyes in various examples. Hidden typography in security Infraredesign graphics can be implemented in pixel graphics, hidden typography in linear vector graphics, hidden typography as programmed dot structure, coded typography or typography as part of the raster and a rasterization process.

Among the various applications of Infraredesign is the one of “Dual - Twin” colours, which comprises the pairing of process and spot dyes - inks. Twins of colours which are investigated for every printing technique, dye type and substrates, are the basis for realisation of hidden information in near infrared spectrum by the Infraredesign method. Further, we discuss new spot twin dyes and their simulation with process set of dyes. In this sense, we propose the palette of twin dyes for various dyes, materials and printing techniques.

In the paper we concentrate in the use the results of experimental work of establishing the twin colours in their double V-NIR form. Double “dual - twin” graphics are a multilevel solution which is confirmed and detected in NIR spectrum with the sophisticated forensically device like Projectina. The prescriptions of the twin dyes are prepared in various printing techniques. Furthermore, we

present the algorithm of connection or nesting of the two or more various graphic samples which do manifest themselves differently in visual and near infrared spectrum. Each of the graphics has a separate domain for its appearance in a defined - specified light spectrum. This solution is the basis for the new printing technique as no mode exists in which by selective filtration in extended light area return to the starting state of creation of graphic samples is possible. In the plan of the dyes the dualism of the spot dyes is introduced. The same spot dye is created by the two or three various chemical prescriptions in order to reach different manifestation out of the visual spectrum. Research conducted revealed that with the twin colours, can provide a solid colouring and hidden image application for security printing, via the advanced combination of various elements - graphics in pairs of dyes-inks. Security linear graphics are realized in the rosettes, guilloche and Bezier's curves made in loops, in order to include infrared component by thin lines which do overlap at various levels. Security linear graphics are created with sophisticated program solutions and realized with twin dyes cannot be copied without knowledge of all established parameters. Reproduction by photocopying is impossible because the copy loses its continuity and appearance of the image in the extended spectral V-NIR area. Inside the infrared vector graphics linear typography is programmed.

## **Characteristics of the Greek banknote in the 1954-2002 period: The numbering**

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### **ABSTRACT**

A further factor ensuring the banknote's authenticity, is its "Serial Numbering".

This Serial Numbering has evolved greatly since its first appearance, and perfectly illustrates the advancements in modern anti-forgery measures.

Banknote forgery was a subject that greatly affected most banknote printing agencies early on, as well as the ones specializing in their construction. Banknote forgery first appeared in the 13<sup>th</sup> century, along with banknotes. Progress against said issue allowed for confidence to grow between users of the printed currency, while also greatly reducing any instances of forgery.

At the tail end of the 19<sup>th</sup> century, a unique Serial Number is first used as an additional security measure. This Serial Number is added during the finalization of the banknote's printing process. It acts as a seal, essentially, encompassing all other security measures while giving a unique identifier to the banknote itself. Each banknote is unique, because they each have a different Serial Number. This also serves as a way to confirm which banknotes are genuine and which aren't, while also reducing the chance of duplicate numbers appearing. The archiving of Serial Numbers that are in circulation, also serve as a way for Authorities to protect against robberies. The banknote is then a complete product that can be safely placed in circulation.

The positioning and coloration of the Serial Number row placed on each banknote is of great importance, along with its other characteristics. These characteristics are used to verify its authenticity, while also making any forgery efforts difficult. This advancement in the production of banknotes serves to highlight progress in their technology.

By comparing banknotes from different countries alongside the Euro, one can come to conclusions on a worldwide scale.

In conclusion, the Serial Number plays an important role in establishing the uniqueness of each banknote. It illustrates the technological progress through the consistent research of both Authorities and manufacturing companies that serve to ensure their authenticity. This authenticity is used

as a measure of security, and in combination with the technology used, proves in the process that the banknote is genuine. Through this proof and security, the banknote is in turn favored and trusted by the consumer.

## **Χαρακτηριστικά ασφαλείας του ελληνικού τραπεζογραμματίου περιόδου 1954-2002: Η αρίθμηση**

Ένα σημαντικό χαρακτηριστικό ασφαλείας των τραπεζογραμματίων είναι η αρίθμηση τους.

Η ιστορική αναδρομή του σειριακού αριθμού από την εμφάνιση του μέχρι σήμερα παρουσιάζει την εξέλιξη των μέτρων ασφαλείας .

Το θέμα της προστασίας των χαρτονομισμάτων απασχόλησε από πολύ νωρίς τις εκδίδουσες αρχές, αλλά και τις εξειδικευμένες κατασκευαστικές εταιρίες. Το φαινόμενο της παραχάραξης εμφανίστηκε τον 13<sup>ο</sup> αιώνα, σχεδόν παράλληλα με την εμφάνιση των χαρτονομισμάτων. Η πρόοδος στο θέμα της ασφάλειας, βελτιώνει σημαντικά στην απόκτηση εμπιστοσύνης των συναλλασσομένων και περιορίζει τις δυνατότητες παραχάραξης.

Μόλις στο τέλος του 19<sup>ου</sup> αιώνα εμφανίζεται η χρήση σειριακού αριθμού σαν επιπρόσθετο μέτρο ασφάλειας. Προστίθεται στο τελευταίο στάδιο επεξεργασίας του τραπεζογραμματίου. Ουσιαστικά, επισφραγίζει όλα τα άλλα μέτρα ασφαλείας, δίνοντας μοναδικότητα. Τα τραπεζογραμμάτια δεν είναι πανομοιότυπα, γιατί το καθένα από αυτά έχει έναν μοναδικό σειριακό αριθμό. Η χρήση σειράς ενισχύει την γνησιότητα και βοηθάει να μην υπάρχουν επαναλαμβανόμενοι αριθμοί. Η καταγραφή όλων των σειριακών αριθμών των προς κυκλοφορία χαρτονομισμάτων από τις εκδίδουσες αρχές προστατεύει από κλοπές. Πλέον, είναι ένα ολοκληρωμένο προϊόν που μπορεί να κυκλοφορήσει με ασφάλεια.

Η μελέτη της θέσης της αρίθμησης κατά τον σχεδιασμό του τραπεζογραμματίου αποδεικνύει την σημαντικότητα του. Η αναφορά στο χρώμα και στα άλλα χαρακτηριστικά του σειριακού αριθμού επιβεβαιώνει την αυθεντικότητα των τραπεζογραμματίων και αποδεικνύει την δυσκολία που δημιουργείται στους πλαστογράφους . Ενώ, η περιγραφή της παραγωγικής διαδικασίας παρουσιάζει την τεχνολογική εξέλιξη και πρόοδο.

Με τη σύγκριση τραπεζογραμματίων άλλων χωρών, καθώς και του ευρύ προκύπτουν συμπεράσματα σε γεωγραφικό πλαίσιο.

Ουσιαστικά ο σειριακός αριθμός παίζει καθοριστικό ρόλο στην μοναδικότητα του τραπεζογραμματίου. Διαπιστώνει την τεχνολογική πρόοδο και εξέλιξη μέσα από τη συνεχή έρευνα των αρχών και των κατασκευαστικών εταιρειών με σκοπό την διασφάλιση της γνησιότητας τους. Αποδεικνύει ότι συμβάλει σημαντικά στην αυθεντικότητα αυτών, ως χαρακτηριστικό ασφαλείας. Επιβεβαιώνει τη συμμετοχή της τεχνολογίας στην παροχή ασφάλειας. Πιστοποιεί ότι δεν είναι προϊόν παραχάραξης, κερδίζοντας την εμπιστοσύνη του συναλλακτικού κοινού.

## **Circular Economy and Packaging Materials**

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## Keywords

packaging; sustainability; linear model; circular economy; reuse; renew; rethink; recycle; life cycle assessment; life cycle cost; packaging materials; biodegradable materials; bio-waste

## ABSTRACT

The problem of environmental pollution and consequently the major issue of climate change are some of humanity's most critical challenges. Today, the need to remedy the problem is more urgent than ever and this is confirmed daily through various environmental disasters. Invoking the concepts of sustainability is therefore vital. Packaging production processes as well as the transportation and disposal of related products are some of the main contributing factors to the environmental problems. The scope of this article is the investigation of the possible solutions of these problems that derive from packaging. Most of the issues caused by packaging related processes are traced to the linear model of production-consumption and disposal methods. In response to the environmental problems arising from this model new approaches based on circularity were developed and continue to expand through economic, theoretical and practical research. Modern tools can be used, such as Life Cycle Assessment (LCA) and Life Cycle Cost (LCC), in order to collect data, which help to compare and evaluate the life cycle and related costs of a package. The central idea of the circular economy is acceptable in general, but its proper implementation, the specificities of the local community and economy must be taken into consideration. Additionally, the basic strategies of the circular economy which can be summarized as Reduce, Reuse, Renew, Rethink, Recycle, enable the selection of appropriate redefining practices that aim to harmonize packaging with contemporary environmental needs in the context of sustainable development. Circular economy strategies aim to produce sustainable packaging solutions, whether it is designing and creating new packaging products from scratch or updating existing ones. Cost savings, raw materials, energy transportation and disposal are some of the most important factors that circularity is concerned with. To maximize the long-term sustainability of a packaging product, environmental, economic, societal parameters must be included in the research and development phases. In addition, in order all these parameters to work properly, the contribution of customers is important and for that reason the information on how to discard or transport a package for reuse should be clear. The paper focuses on certain indicative examples of the circular economy strategies which have been researched and studied. For example, the return of a packaging for reuse, the use of biodegradable materials and sundry ways to dispose of them and certain modern, more efficient methods of recycling. In summary, this paper presents the contemporary approaches which highlight the need and the possibilities of choosing appropriate materials and practices to redefine and harmonize the packaging with the environment in the context of sustainable development on a global scale.



# **SESSION 5A**

## **Print - Media Education**





## **LIFE ARCPROM: visual communication and educational possibilities in distance learning**

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### **Keywords**

Fine Arts School, environmental education, visual communication, human-bear coexistence, distance education, life arcprom

### **ABSTRACT**

#### **Introduction**

The project is about the visual communication of an environmental program resulted from the cooperation of the Department of Fine and Applied Arts of the University of Western Macedonia in collaboration with four National Parks in two countries (Prespa National Park, North Pindos and Rodopi (in Greece) and Majella (in Italy) as well as two environmental organizations (Callisto and WWF Italy) and the School of Veterinary Medicine of the University of Thessaly. The School of Fine Arts was responsible for the planning and coordination of visual communication. The program is co-financed by 75% by the EU LIFE program, the Green Fund and the partners' own resources.

#### **Programme content**

##### **A. Objectives**

The main goal is to improve the brown bear-human coexistence in the regions of South-eastern Europe and especially in Greece and Italy. More specifically, the treatment of bear approach in residential areas, the minimization of illegal practices such as the use of poisoned baits and the implementation of effective measures to prevent damage by large carnivores in the agricultural and livestock economy.

##### **B. Originality of the project**

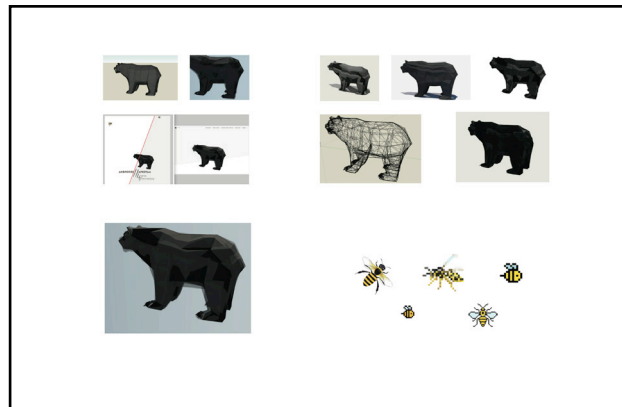
It is the first time in a LIFE program that the visual communication is undertaken by a University and specifically by a School of Fine Arts, whilst the usual practice is the direct assignment to an external designer. This path led to the activation of a creative body which at the same time entrained the students of the institution. As the subject of environmental vigilance has a universal impact the involvement of the School of Fine Arts has been crucial in raising awareness of the wider society.

## Design Objectives and Education

The biggest part of the project was accomplished during the lockdown of COVID-19 pandemic via digital communication and distance learning.

### A. Form search and design principles

•One of the main issues was the bear as a *form* and the environment of the it. There was chosen a geometric figure, fragile and dynamic at the same time. For this result there was undertaken a re-search on other approaches to the subject such as fieldwork and communicational and educational interaction with the involved bodies and students. The final result incorporated the dynamics of a creative collaboration.



•In addition to the bear form itself, *parallelism* was a key idea in the composition (parallel lives, the mathematical symbol, the bear parallel to man, symbol set does not show anyone stronger or weaker but parallel). These two elements run through overall the visual identity of the project (logo, website, prints, poster, rollups)



### B. Education and involvement of students

The university educational staff was involved with lectures and two open calls for production of works. The students were informed about the objectives and the course of the program, gave feedback with works of art that finally formed a new field in the website, a digital gallery entitled *bear-arts*. At the same time, the students implemented procedures walking art following in the footsteps traces of a bear in the area of Mesonisi / Florina and relational art practices, rescuing the skeleton of a poisoned bear and reconstituting it (Psarades area). An oral history process (named Bear Stories) was also activated where stories about the bear were collected from participants in the program and illustrated.

## Results

a. There was participation, interaction, training as well a community of artistic and environmental

- fields was created interacted, inspired and support each other.
- b. Connections, inquiries and reflection on the specific environmental and social issue and development of horizontal student skills
  - c. There was awareness and engagement through art with the production of works of art and relational practices.
  - d. Art and Ecology osmosis was performed as vehicle of approach and creation of a more advanced consciousness of the modern person.
    - e. Complete communication material was created: website, shared map display, bookmarks and signs, information material, calendars.

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<https://lifearcprom.uowm.gr/>

## Education in the pandemic situation in Polytechnic of Tomar

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## Keywords

Distance learning; Pandemic; Challenges; Opportunities, Polytechnic of Tomar, Education

## ABSTRACT

At the end of 2019, we faced the spread of the SARS-CoV-2 virus, which causes COVID -19. As it's a virus with very high contagion, the World Health Organization classified this situation as Pandemic, ordering that preventive measures and mitigation of risks related to the spread of the virus be taken, such as the interdiction of the places of work, using the telecommuting regime and leading to the closure of schools and universities, affecting education systems globally.

With the worsening of the pandemic situation and as of mid-March, with the closure of higher education institutions and the suspension of face-to-face classes, there was an enormous and widespread effort to respond quickly to a totally unexpected circumstance.

For the Graphic Arts Design and Technology degree at the Polytechnic of Tomar (Portugal), this pandemic caused both students and teachers a sense of speed and adaptation. In view of the new challenges, the need was to determine the link between isolation and the interruption of classes. With determination, creativity and some improvisation, educational institutions and teachers found ways, so that the connection with the students was maintained.

In Portugal, higher education institutions already had digital learning resources, based on the Distance Education (EaD) modality. There were, however, some limitations, where some students are unable to access at the same time, especially with regard to discrepancies in access to (DE) resources.

The pandemic also showed the weaknesses that the educational system possessed, particularly the different preparation and knowledge that its main actors (teachers, students and staff) had in technological terms, as well as the training they had to be able to be prepared to deal with these adversities.

Some teachers despised the idea of having to use computer and technological resources at a professional level, and were therefore surprised by the forced use of distance learning. However, the

majority resorted to the mechanisms they had and increased the hours of work in order to reach all their students and continue to provide excellent teaching. Distance Education, working synchronously or asynchronously has proved to be an added value, which teachers, students and staff have overcome in mutual support, contributing to learning. In this perspective, this article aims to analyze the modifications and adaptations of remote education in the courses of Communication Design, Design and Graphic Technology, seeking to indicate the challenges that COVID -19 caused, as well as the current teaching opportunities. The analyzes are the result of personal experiences lived by the teacher during his classes in the disciplines of Prepress (Pagination and Imposition). It thus considers it possible to show the main difficulties felt and to be improved and the prospects for teaching.

## **Nude, Empathy and Neuroaesthetics in the perceptual process**

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### **Keywords**

Art, nude, female body, neuroaesthetics, perception.

### **ABSTRACT**

This study deals the role of the aesthetic experience (empathy and neuroaesthetics) in the perception of beauty and «nice» as factors in the education and composition of the individual. Specifically, their relationship with the naked female body as a carrier of this process is examined. The first part talks about the interdisciplinary branch of neuroaesthetics that examines the relationship between the brain and mind, as well as neuroaesthetics as a source of understanding and highlighting the beautiful. In the second part, a correlation is made between the “high” and the “beautiful” with reference to the female nude, as a carrier of the perception of the beautiful. The value of visual experience and its different effect from person to person are then explored. What follows is the correlation of art, as a visual representation of reality, with brain processes as it encourages artists to discover new techniques that prevent the brain from being separated from reality. Given that nudity is a measure in art, passages are presented from representations capable of further illuminating the relationship between art and visual perception, aesthetic experience and understanding. As an expected result of this work is the highlighting of the value of art and specifically the nude in the training of the cerebral perception of the beautiful.

### **1. Introduction**

#### **Neuroaesthetics, nudity and empathy**

The field of neuroaesthetics is considered an interdisciplinary field, which interests both the humanities and the cognitive and neurobiological sciences. Neuroaesthetics is a field of neuroscience that studies the aesthetic experience in the human body through brain processes and how these brain processes are influenced by current social norms and philosophical tradition. Neuroaesthetics is based on the attempt to objectify reality in the aesthetic experience and deals with the general perception of beauty and the “nice”.

## 2. The nude as a measure in art

Socrates was the first to ask philosophic questions about the concept of “beauty”, followed by Plato with his own theories that are evolving in contemporary science (Benardete and Bloom, 2001). Aristotle and Plotinus (later) developed their own theories. Kant made the distinction between “high” and “nice”. According to **studies**, aesthetic experience is an inherent process, which, however, is greatly influenced by social norms, intimacy and experience, time of exposure to a stimulus and learning. Artwork can trigger emotional experiences for the observer. An observer may e.g. feel involved in the experience of the image he sees in a painting (Brinck, 2017). When it comes to nudity in art, the iconography of the goddess Aphrodite could not be ignored. Undoubtedly, nudity has been one of the most popular and widely discussed topics in art. Dalli scratched Aphrodite with drawers, associatively transferring the image to the cognitive level of neuroaesthetics (Clark K., 1956: 2-3).



*Left: Aphrodite and Eros. Interior folding mirror decoration, Bronze gilded, Diameter 7 1/2 inches (Louvre, Paris). Eros pulls his bow. 350 BC*

Long before classical antiquity, the nude was the favorite work of craftsmen / artists. In classical antiquity the Greeks upgraded it to a supreme thematic motif (Eco U., 2018: 210). The human body in antiquity was God’s work, while the concept of the nude differed from its current view.

## 3. The tendency to perfect the work of art

The ancient Greek artists tried to create a “divine” work through the nude, in other words, to create a goddess or a divinity. Praxitelis and his contemporary artists secured beauty through knowledge, tried to breathe more life into the original form, so that a new true human being could emerge in a different and better world (Gombrich E., 1989: 102-104 ).

## 4. The measure in the art of Greek antiquity

Is there a mathematical key to beauty? The artists have designed harmonious relationships based on pure geometric shapes from time immemorial - while many have applied the Golden Section of Polykleitos.

## 5. From the half-naked to the naked and the undressed

Aphrodite is one of the first goddesses who appeared at first half nude and then completely nude, she had to communicate as a new Eve. The case of Cnidia Aphrodite, the first and perhaps most beautiful sculpture of antiquity, the naked statue of the goddess (Corso A., 2007: 303. Several centuries later after Botticelli, in 1863, Edward Manet painted the **painting** “Olympia. Art historians claim that the artist allegorically presents himself. According to Kenneth Clark “there is the nude and the naked”. To be naked means to be deprived of one’s clothes and the word implies some embarrass-

ment that most of us feel when we are in this state.

## 6. Naked – Undressed

Going back to the history of the naked from antiquity to European modernism, the researcher struggles between the **six** of sensuality and the pleasures of contemplation, while he must get rid of the two impulses that overwhelm him. Clark uses the process of sublimation to stay true to his judgments. Controlling the representation of a naked, erotic, but not so sexual as to absorb the audience, is the triumph of his successful representation. There is a transition from the concept of the nude to the naked itself. It is the process of transformation, so that the nude becomes a perfect object of art. “The naked remains the most complete example of the transformation of matter into form” (Clark).



*Peter Paul Rubens, Leda and the swan, 1602, Museum of Fine Arts, Houston*

## 7. A few centuries later - Between undressed and naked

Why does Manet’s “Olympia” become a scandal so many centuries later? Why did it cease to be the triumphant nudity of Aphrodite (in the sense of classic beauty) and is made of nude - naked? Just take a look at Velasquez’s “Aphrodite in the Mirror”: Spanish society was very conservative at the time and this painting is probably the oldest nude in Spanish painting. In 1914 Velasquez’s “Aphrodite” was attacked by a suffragette, who stabbed her in the waist and back in defense of women’s equality. The “Naked Maya”, between nude and naked, is a provocative woman who offers her beauty. She is not wearing the nudity of Aphrodite but of the naked woman who is waiting with a playful look for her lover in the crumpled sheets.

## 8. The nude (= naked) in the “society of transparency”

Today, according to **one version**, visual communication is structured and projected as infection, as an outbreak or as a reflex, without having elements of aesthetic reflection. Or, it is characterized by a sensation that is **anesthetic**. The aesthetic judgment of the individual is expressed e.g. with a Like, while no resilient mood, no **visa** is required. Simplified images and loaded with great exhibition value are indistinguishable from any complexity; they stand unambiguous, essentially pornographic.



*Model on an internet website.*

In the society of transparency, the tactile perception marks the “*end of the aesthetic distance of the gaze*” (Han B., pp. 32-33) In the naked body, one is affirmed above all beauty, the high, as well as a work above every image: the work of the Creator “. That is why only one form or one creation can be evaluated and recorded as beautiful. In contrast to **this view**, amorphous and non-iconic nudity is high, which as a component of beauty has no mystery. That is why, remarkably, the high is superior to the beautiful. However, the peculiar nudity of creation has absolutely nothing to do with pornography; on the contrary, it is high, praising and testifying to the work of the Creator. According to Kant, an object is characterized as high when it transcends every representation, every virtuality. In other words, the high goes beyond the show. Agamben attempts to conceive of a nakedness free from any christian ordinance, that is, a form of nakedness. So, in order to make this clearer, he extends as pornographic the Benjamin high of the naked body. Benjamin’s high, in which he contrasts fine phenomena, is far from any exhibition value. Exposure destroys the high plasma. The high has the power to produce worship value, while the pornographically exposed person, who at all times flirts with anyone in front of him, alone can not be high (Han B., pp. 46-47).

### **9. The «dressed» naked**

Praxitelis is the master **builder** of the nude, that is, **of the naked**. He himself had previously created a series of half-naked works, as well as the naked body with a fabric that sticks to the body and gives the naked even “more nudity”. Difficult transitions can be made smooth by the flow of the line. The garment makes the bodies of 6th century girls as beautiful as one can see in the masterpiece, the throne of Ludovisi, where the body of the naked girl with the flute moves us less than that of the lightly dressed emerging Aphrodite.

### **10. Conclusion**

Although there are objections from scientists of the philosophy of aesthetics, according to the reductionist path used by neuroscientists, some real conclusions emerge about the influence of art in the process of the perception of beauty and **«nice»**. Both neuroscience and art, as well as philosophy, are achievements of human culture, intellect and aesthetic creativity, based on the biological background of the brain, its organization and functions. However, it is understood that their ontological dimension is due to factors that are beyond the limits of their biological existence. From Socrates, Plato, Aristotle, Plotinus, to Kant and modern **thinkers**, theories of beauty were developed, and many of them made the distinction between “high” and “**beautiful**”. It is a fact that nudity was a measure for art and this is confirmed by a number of applications. From the first nude represen-



tation of Aphrodite of Cnidus to its renaissance repetitions, the nude went through a course of centuries characterized by its innumerable transformations, from the half-nude to the nude, from the nude to the naked and its other transformations, as described from creators and art critics to the present day.

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## **SESSION 5B**

# **Typography, Layout and Design for Print and Digital Media**



## **E-books and apps for children: the characteristics of the enhanced e-book formats in the Greek language**

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### **Keywords**

Enhanced e-book; epub 3.0; apps; children's book; Greece

### **ABSTRACT**

New media and the evolution of the children's book in terms of content and form contributed to the emergence of the digital form of the children's book. The e-book is often considered as the digital reproduction of the printed book, but in such a context the publishing sector does not take advantage of the numerous possibilities of the new form of children's book, which are gradually becoming available to more and more young children.

The "EPUB 3.0" format and the interactive "apps" may have advanced features for an enhanced reading experience: the verbal mode may be narrated, the visual mode may be animated, etymological dictionaries and multimedia, such as video and audio, may be integrated. The synergy of verbal, visual and other modes is transferred to the digital environment and the enhanced e-book may take various forms and functions. An illustrated book can become a wordless or an audio book while the simultaneous presence or multiple combinations of the various modes depend on the child choice. The narrative becomes interactive and the child takes on the different roles of reader and co-creator, experiencing a reading process according to his needs and desires.

The article focuses on the characteristics of the enhanced formats of the children's e-books published in the Greek language, since 2013. The choices of publishers and providers of digital content were crucial to the type of digital reading offered to the child during the early years of the e-book in the Greek world, as the digital book may facilitate story comprehension through features that enhance the reading process. An overview of the enhanced forms of e-book it is expected to capture the dynamics, the trends and the possibilities of the children's e-book in a world of printed books. In the future, the e-book is expected to take a decent place next to the printed book. The printed and digital form of children's book will work either independently, in parallel or together, in a world where the child will be able to decode multiple messages, as a reader familiar with the diversity of each form of children's book.

## **Enhancing the identity of cities through the integration of public art**

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### **ABSTRACT**

During the past sixty years cities have globally experienced massive growth and transformation. During this time public space, which through its significance and value for society is often associated with city's identity, has undergone substantial change. Especially in modern cities, public space has either disappeared or lost its critical meaning and value. This can be highly related to a set of factors

that also influence the visual identification and aesthetic appreciation of a place. Contemporary architecture and urban design practices constantly call for standardization of structures and along with the massive socio-economic trends of globalization and unprecedented urbanization have resulted in massive and rapid urban developments which usually lack meaningful experiences as well as socio-cultural and visual identities.

So what could possibly be the role of public art in addressing this crucial and fast developing urban challenge? This paper deals with theories on aesthetic appreciation and visual perception of space as well as on urban space recognition, especially assessing the role of public art in improving the 'imageability' of public realm and essentially its identity. Imageability can be understood as the "quality in a physical object which gives it a high probability of evoking a strong image in any given observer" (Lynch, 1960: 9). Urban imageability is associated with the human need to identify and structure a perception of the physical environment particularly in the complex and shifting context of cities (Larice and Macdonald, 2013).

This study will therefore focus on the role that public art can play in creating positive identities and visual perceptions of public space within urban contexts. Indeed, the increasing popularity of culture and art-led urban transformations along with wide of acceptance of art amongst placemaking practices offers exciting possibilities for the creation of diverse and varied 'happenings' within the public space that can animate the city and form places that afford great aesthetic experiences and enhance people's visual perception of space. Such urban artefacts can be designed to be collaborative, engaging and inclusive and in this way constitute part of strategies to foster positive urban experiences amongst societies around the World.

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## Publishing challenges and solutions for tablets and e-books.

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## Keywords

Electronic book, categorizations and format of e-books, templates and technologies of creation and reading, e-reading, copyright

## ABSTRACT

This paper seeks to explore the concept of e-book through a series of concerns associated with it. Starting with a comprehensive introduction around what we define as an e-book, the search continues around the devices of use as well as its creation and reading programs. Initially, definitions and classifications are presented around the concept of e-book. Then, through targeted research, multifunction devices are compared and the best-known e-book creation and reading programs are assessed. Continuing the search, a necessary concept to explore is the process of electronic reading. In particular, the question 'Electronic reading or paper reading?' is asked. Paper reading is analysed and compared by electronic reading and advantages and disadvantages of their use are examined.

The last but equally important part of the concept of e-book is the field of copyright, the protection enclosure of the book. The dominant question that guides the work's research is "How are copyrights incorporated and operated in e-books?"

Heading towards the end, the conclusions of the research process are presented in relation to the main research concerns. Initially the book seems to be a vessel of communication between author and reader in any form. In the electronic version the reader chooses from multiple reading devices that enclose his daily life, while depending on the creator or reader but also according to the features and requirements you choose the appropriate creation or reading software. It is often the view that an e-book is only a digitized copy of a physical book, which is inaccurate. Since an e-book can also be an entirely e-born book, which follows the corresponding structure, adopting different characteristics e.g. menus. The new generation is certainly developing new ways of learning, while also enhancing the ways of interacting and improving technical characteristics in reading devices. It is necessary under the legal framework of use to have safeguards either with active or passive digital rights and it would be a good idea to choose a management system.

The expected results of the work are anticipated to be a handbook of reflection and guidance for future scholars, who will choose to wade into the field of e-book. Moreover, it would be particularly important to provide stimuli for even more specialized research, including questionnaires around the preference of form, electronic reading but also the establishment and use of copyrights with their advantages and weaknesses, in Greek reality.





## **SESSION 6**

# **Typography, Layout and Design for Print and Digital Media**



## **Label Design Checklist. A proposal to apply sustainability to education and to professional practice**

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### **Keywords**

Graphic Design, Graphic Production, Labels, Sustainability, Education

### **ABSTRACT**

In the context of our society's continuing need to mitigate climate change, graphic arts and graphic design professionals and educators must continue to contribute with concrete and consequent measures. Radical measures that promote very significant changes are difficult to implement as they often bump into social, cultural or political contexts that are still adverse to this type of shifts. This is especially true in consumer capitalist societies, where values such as profit and economic development, seduction or other values centred on an egocentric individualism are deeply rooted. Incremental measures, even if with less positive impact than radical measures, are easier to implement and tend to be able to obtain faster results, in the short and medium term.

Changing this context at the professional level is not easy, but if we can foster these good practices in future professionals, while attending their studies, we may be able to obtain better results, which should be a fundamental commitment of HEIs.

Our proposal is to focus on specific areas of graphic design and production and suggest concrete measures to reduce the environmental impact, if possible with benefits in the economic and social dimensions of the production and consumption of graphic communication artefacts. For that, we start from a specific area, labels, whose production is expected to continue increasing in the near future. This is a rather important area in the regional reality where our school stands, where many companies use this medium, especially from the agrifood sector; and where is also an interesting number and quality of printing companies that provide this service.

In methodological terms, we started with literature review, consulting especially life cycle design and graphic design checklists. In a second phase, based on our knowledge and experience on regional and national realities, we designed a checklist for the labels area.

The checklist we propose covers paper and plastic labels, which can be applied to different types of labelling, but especially to cases of medium and high runs, produced with traditional printing processes.

In addition to issues related to materials and graphic production, which are normally found in other checklists, we have included several aspects related to graphics, directly related to designers' skills. In the consumption dimension, aspects such as inclusiveness or consumer information are considered. In both dimensions, we also consider aspects related to co-design.

In an initial phase, we have been applying this checklist in academic works, in several subjects of the Communication Design degree program. It is our goal to test this checklist in an interdisciplinary way,

promoting a scenario of sustainability in the training of designers and integrating the contributions of students in future improved versions of the list.

We would also like to receive contributions from fellow educators of other HEIs and other countries, in order to improve this initial version and disseminate it to colleagues who are interested in using it. At a later stage, we aim to include printing companies' suggestions and try to implement the checklist in professional situations.

## **Transformation of Study Programmes in the field of Media Industry in Lithuania**

*Daiva Sajek, Virginijus Valciukas, Kaunas University of Applied Sciences (KUAS)*

### **Keywords**

Multimedia technology, graphic and digital media, professional standard, European qualifications framework, qualification level.

### **ABSTRACT**

Transformation of the Study Programmes (SP) is determined by change of the professions and qualifications in line with the shift in the field of Media industry. First, we need to evaluate the change of the professions and qualifications related with transition from Print Media to Transmedia – multiple media forms – and to identify future skills. It is necessary to evaluate changes that have a direct impact on the Media industry, in particular prepress, press, post-press, digital media, soft skills, etc. It is also important to take into consideration, that the 21st century skills for European Qualifications Framework (EQF) VI and VII qualification level such as communication, digital literacy, fluent Human-Computer Interaction, social, intercultural skills, creativity, critical thinking, problem solving, teamwork differ from traditional academic skills. Furthermore, the importance of the soft skills in the future is projected to grow significantly.

Transformation of Media Study Programmes in KUAS is based on the Occupational Standard for the Graphic Technologies, Media and Advertising Sector, developed in 2019, in Lithuania. Preparation of the list of qualifications and their descriptions regarding the current situation in the economic sector was assessed, in line with the expectations and interests of all social partners and long-term perspectives, too. Detailed description of the research and the list of key qualifications was published in the proceedings of the annual conference Innovations in Printing, Publishing and Multimedia Technologies, KUAS, 2019. <http://ippmt.kauko.lt/proceedings/>

EQF VI and VII qualification level specialists are trained in Lithuanian Universities and Kolegijos (UAS). At present, approximately 12 Professional Bachelor's (PB) Study Programmes are offered in UAS, in contrast to 10 undergraduate study programmes in universities in the field of Media. The majority of the SP are available in the field of Social sciences and Arts. Regardless the needs of industry, studies in technologies and engineering are not popular among young people.

KUAS is the second largest institution among the Kolegijos in Lithuania. Approximately 5,000 students are majoring in Social and Humanitarian Sciences, Medicine, Technologies and Arts. Department of Media Technologies offers three Professional Bachelor's Study Programmes: MT - Multimedia Technology (~200 students at present) in the field of Information Engineering; AT - Advertising Technology (~20 students) and GDM - Graphic and Digital Media (~10 students) in the field of Material Technology. The main problem is how to make the GDM and AT studies more appealing, how to increase the number of students, at the same time responding to Media market needs and requirements of professional standard.

The Board of the Committee of Material technology at KUAS recommends to merge both the programmes AT and GDM; to introduce digital technologies into the curriculum; to switch from conven-

tional to digital printing, and from e-publishing to web, etc. As the large number of students quit the studies (about 25 %) for different reasons, the Committee recommends to introduce distance learning tools in the studies.

## **Survey on online teaching in graphic engineering and design in a time of pandemic**

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### **Keywords**

Online teaching, challenges, graphic engineering and design, pandemic

### **ABSTRACT**

Covid-19 pandemic has created a big challenge for educational institutions. Adapting the lectures from classic, face-to-face approach, to online meetings was essential in slowing down the pandemic. Zoom, Microsoft Teams, Cisco Webex, online platforms etc. have replaced classrooms and become new gathering places for students and lecturers all over the world. Both parties have invested a vast amount of time and effort to overcome the potential obstacles, and adopt the online teaching process. As a higher institution with a long educational tradition, we have strived to perform online teaching on the highest possible level from the very beginning. Since the certain experience has now been gained, we can discuss the benefits and disadvantages of this type of teaching.

In this paper we wanted to pinpoint the advantages of online classes and the challenges students and lecturers at our home department faced so far. We formed an anonymous survey to determine how they are approaching online classes, what are the benefits, struggles, as well as to evaluate if this form of teaching have reached certain level of familiarity, so that it could be efficiently used in the following period.

The main advantage of online teaching from the point of our students is the ability to attend the classes from any physical place. They didn't have any problems to adapt to the software and platforms for online teaching, and were satisfied with the performance of online software tools used. The obstacles they encountered were inability to focus and maintain their motivation, sense of isolation, prolonged screen time and technical problems affecting their efficiency (the unstable internet connection was the most often reported). They also believe that the availability of internet and mobile devices in household conditions affect their attention and decrease concentration, since they can easily access the social networks and participate in other forms of out-of-class communication. Both students and lecturers agreed that the biggest drawback of online teaching is a lack of face-to-face communication. Hence, it is no surprise that the challenges lecturers are facing are to engaging the students in the classes and maintaining their attention.

Students do not think that online teaching has increased their presence or engagement in the studies. At this point, it seems that neither our students nor lecturers prefer online teaching over traditional form. Despite the fact that our home institution provided online teaching platform and course format that are globally adopted by all eminent academic institutions, there is still a room for improvement of online teaching in order to gain all the benefits of traditional approach. We believe that structuring the lessons by having in mind all the possibilities of online tools is essential.

We have to emphasize that the majority of the inquired students didn't have any prior experience with online learning, meaning that they have not been involved in it in non-pandemic conditions. Thus, their opinions on online learning might be strongly influenced by the pressure and uncertainty

they are experiencing due to the global crisis.

## **The Effects of Audio/ Visual Stimulation and Virtual Reality to Increase the Rate of Retention in First Semester Freshmen Graphic Communications Students.**

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### **Keywords**

Flexography; retention; virtual reality

### **ABSTRACT**

This research stemmed from the COVID-19 pandemic and the learning restrictions that were placed among educators across the world. Graphic Communications students are kinesthetic learners, and the virtual environment eliminated the ability to provide hands on learning. This research is focused on one process that Graphic Communications students learn called Flexography. The question at hand was, how do we educate kinesthetic learners on a new process for which they have no prior knowledge in a virtual environment? This led to the design of this research project that was executed in Fall 2020 during the COVID-19 pandemic on first semester Freshmen students at Clemson University.

The 100 students were divided into 3 separate groups at random. The groups were given a pretest to determine the baseline level of knowledge on a flexography printing unit. Then, all three test groups were given the same oral lecture on a flexography printing machine delivered through zoom recorded lecture. This lecture was primarily focused on audio/visual learning methodologies. The learning of the Flexography unit within the lecture was confined to a diagram. Each group was given a different accoupling assignment. Group 1 was the control group of the experiment who only received the recorded lecture. Group 2 was given a supplemental video in which someone showed them an actual Flexography machine and went through all of the parts and printing processes. This was modeling the process and engaging the students by forming more connections between parts and functionality. However, Group 3 was given an assignment which involved the usage of VR software designed by the Sonocco Institute. This VR software did not require goggles and was a complete web-based software in which they were emersed into a press room and given the opportunity to turn parts on and off and even upload and print trials of their own artwork. There was not a formalized press run given to the VR students. Instead, they were encouraged to push their boundaries and be curious in the software. Students were instructed to spend at least a half hour in the virtual press room. The three groups were given a posttest identical to their pretest that was based on the diagram gone over with all of the students.

The results of the experiment concluded that the usage of Virtual Reality software in virtual learning situations is a beneficial factor for student success and connectivity when educating STEM students. Where many students in groups 1,2, and 3 were able to label the diagram, group 3 students outperformed the other groups when explaining the function and usage of each part on the diagram. This experiment was performed on a test group of 100 students, to further test this the experiment needs to be repeated on many larger subject test groups without prior knowledge. In addition, this experiment would be great to test within industry as a training mechanism for press operators in a virtual learning or pandemic situation.

## **SESSION 7**

# **Print Museums and History of Printing**





## **Polytechnic of Tomar's letterpress print shop. An industrial heritage to safeguard, enhance and share**

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### **Keywords**

Letterpress, manual typesetting, mechanical typesetting, Polytechnic of Tomar, Education

### **ABSTRACT**

Polytechnic of Tomar's letterpress print shop has a unique collection in the panorama of the HEIs and similar printing houses in Portugal. This industrial heritage comes mostly from Imprensa Nacional Casa da Moeda, the national public institution responsible for producing, among others and for several centuries, official identification documents, coins or Portuguese State's official publications. Among the collection there are several manual and mechanical composition materials, such as Monotype, Linotype and Ludlow compositors and matrices, or proofing and printing equipment. In addition to the patrimonial value of this collection, typography and letterpress represent interesting values in various dimensions, such as pedagogic, artistic or cultural. Its current use mainly includes IPT students, but it is intended to see this living heritage open to local, national or international communities, specialized or not.

This article is part of a set of actions that these educators have been carrying out in order to promote and enhance this heritage, contributing to its knowledge, preservation and further use. Along with promoting it among IC members, it is also our goal to foster a network of stakeholders from HEIs of graphic communication who may exchange information, experiences, materials and equipment related to letterpress; as well as joining efforts in future projects involving letterpress and the communities that may benefit from it.

The initial phase of this work has been focused mainly on the inventory of movable types, mechanical composition's matrices and printing equipment. Posters have been designed, visualizing existing typefaces, its styles and sizes. In a next step, still in its initial phase, the existing heritage will be organized, conserved and restored: furniture mostly made of wood; types and matrices; machines that are in operation and those that are not operational.

From the print shop's collection we show here the most significant equipment and materials, whose survey and identification is done and which include wood and metal printing types and other graphic materials for manual composition; and for mechanical composition, the types available for Mono-

type. The inventory of mechanical composition materials of Ludlow and Linotype systems is in progress.

In brief, we show here the possible audiences that may have interest in the print shop and its respective added values.

Graphic arts and design students: understanding printed media's historical evolution, of certain terms, procedures and techniques of the profession; typography and text composition deeper understanding.

Artists and designers: author's books; expressive exploration of letterpress techniques.

Writers, poets and publishers: alternative edition, short runs.

Children and young people: valorization of the written and printed word; valorization of manuality; exploration of other important issues for personal growth and civic development.

General population, local communities, senior audiences: knowledge of the local heritage; strengthening the feeling of belonging.

Regional companies and institutions, especially those related to culture, which are directly or indirectly related to letterpress (paper production, fine arts, photography, etc.): establishing relationships with others, developing regional culture; improving educational services.

Letterpress print shops in operation: production of metal types for replacement.

## **Decrypting the security features of the Greek banknote during the 1954 to 2002 period: The watermark**

*Anastasia Pesmatzoglou, Bank of Greece*

*Chrysoula Gatsou, University of West Attica*

### **ABSTRACT**

Apart from being historical artifacts of design languages and tendencies of the past, banknotes also illustrate the technological progress of Graphic Arts as an industry.

Their design is closely associated with Applied Arts. Banknotes are often miniature works of art, combining both painting and engraving. Despite their artistic merit, they have to abide by strict design rules. These design rules need to both serve as hidden security features, while also offering an aesthetically pleasing result.

Banknotes have a very particular aesthetic to them. A lot of emphasis is given to the security features and their subsequent checks. It is important to fully understand why they are included within the banknote, and why they offer an additional layer of security.

Watermarks will be closely examined, especially those printed on banknotes hailing from the period of 1954 to 2002, which were printed by the Greek State. A historical retrospective of the Watermark will allow us to understand why it was included, and the subsequent reason behind their emergence as a prominent security measure for said banknotes.

The design of a Watermark has often proved challenging, due to its inherent importance as a security measure.

Below we shall see the manufacturing process of the banknote, as well as design decisions that are made early on in the design process, such as the size of the banknote, the position of the Watermark and the size of the paper for the printing press. We will also see how the Watermark itself is designed, how its tone is produced, and how it is categorized in different periods according to what it represents. This further illustrates the manufacturing process of the banknote, as well as the complexity and technological advancement of the Graphic Arts sector.

Comparing these banknotes with ones from different countries as well as the Euro, draws further

conclusions on a worldwide scale.

The conclusion being that the Watermark plays a very important role in determining the authenticity of the banknote. It illustrates the research made by each governing authority in combination with the printing press manufacturers. This research serves to ensure that banknotes are difficult to forge, while also allowing for genuine ones to be easily identified through progress in both manufacturing and technology. The watermark alongside with other security measures, ensure that this seemingly innocuous piece of paper has both purchasing power and consumer trust, which allows for it to be used as a form of currency.

### **Αποκρυπτογραφώντας τα χαρακτηριστικά ασφαλείας του ελληνικού τραπεζογραμματίου περιόδου 1954-2002: το υδατογράφημα**

Τα χαρτονομίσματα εκτός από ιστορικά τεκμήρια είναι και απτοί μάρτυρες των εκάστοτε σχεδιαστικών τάσεων και της τεχνολογικής προόδου των γραφικών τεχνών.

Η φιλοτέχνησή τους ανήκει στις εφαρμοσμένες τέχνες. Πρόκειται για μικρά έργα τέχνης που εμπερικλείουν όλα τα χαρακτηριστικά των ζωγραφικών και χαρακτικών έργων. Ωστόσο υπόκεινται σε αυστηρούς σχεδιαστικούς κανόνες γιατί κρύβουν μυστικά, τα οποία πρέπει να υπάρχουν και να εναρμονίζονται με τα αισθητικά στοιχεία τους.

Τα τραπεζογραμμάτια ακολουθούν συγκεκριμένη δομή. Δίδεται ιδιαίτερη βαρύτητα στα χαρακτηριστικά ασφαλείας και του τρόπου ελέγχου αυτών και κρίνεται απαραίτητη η αναφορά τους για την κατανόηση της αξιοπιστίας που προσδίδουν.

Ιδιαίτερη μνεία θα γίνει στο υδατογράφημα και συγκεκριμένα η μελέτη του στα ελληνικά τραπεζογραμμάτια της περιόδου 1954-2002. Με την ιστορική αναδρομή στο υδατογράφημα κατανοείται ο λόγος ύπαρξης του στα χαρτονομίσματα και πως το εμπορικό σήμα των κατασκευαστών χαρτιού έγινε συνώνυμο της ασφάλειας τους.

Η αναφορά στον σχεδιασμό τους αναδεικνύει τη σημασία του υδατογραφήματος, προβάλλοντας τις σχεδιαστικές δυσκολίες αυτών.

Παρατίθεται ο τρόπος κατασκευής του δίνοντας ιδιαίτερη σημασία στις πρώιμες αποφάσεις και ενέργειες που γίνονται σχετικές με το μέγεθος του τραπεζογραμματίου, τη θέση του υδατογραφήματος, τη διάσταση του εκτυπωτικού φύλλου, κλπ. στοιχείων παραγωγής. Παράλληλα, παρουσιάζεται ο σχεδιασμός του υδατογραφήματος, ο τρόπος απόδοσης της τονικότητας και κατηγοριοποιείται σε περιόδους σύμφωνα με την παράσταση του. Ταυτόχρονα, η έρευνα της διαδικασίας παραγωγής τους δείχνει την τεχνολογική εξέλιξη των γραφικών τεχνών και την πολυπλοκότητα των τεχνικών διαδικασιών.

Η σύγκριση με τραπεζογραμμάτια άλλων χωρών, αλλά και με το ευρύ παρουσιάζει τα συμπεράσματα αυτά σε γεωγραφικό πλαίσιο.

Ουσιαστικά αναγνωρίζει ότι το υδατογράφημα παίζει σημαντικό ρόλο στην γνησιότητα του τραπεζογραμματίου. Διαφαίνεται η συνεχής έρευνα και εφευρετικότητα της εκάστοτε εκδίδουσας αρχής για τη διασφάλιση της αυθεντικότητας των χαρτονομισμάτων με σύμμαχο πάντα τους κατασκευαστές μηχανημάτων και υλικών. Αποδεικνύει ότι είναι ένα από τα σημαντικότερα χαρακτηριστικά ασφαλείας του τραπεζογραμματίου που όχι μόνο καθιερώθηκε, αλλά και εξελίχθηκε. Επιβεβαιώνει τη συμμετοχή της τεχνολογίας στην παροχή ασφάλειας. Πιστοποιεί ότι αυτό το μικρό κομμάτι χαρτί, το τραπεζογραμμάτιο, έχει δύναμη, αξιοπιστία γιατί δεν είναι προϊόν παραχάραξης, κερδίζοντας την εμπιστοσύνη του συναλλακτικού κοινού.

### **The exhibitions of the museum of the national printing house**

*Mihalis Kyra Antonis*

National Printing House, Greece

## ABSTRAC

The exhibits of the Museum of the National Printing House refer to the historical alternations of printing art and technique and the evolution of printing from the middle of the 19th century (manual printing press - press) and mainly in the course of printing mechanization (late 19th century and later).

The goal is twofold, on the one hand to present the exhibits of the National's Printing House Museum of Printing in their real scale and with their functional condition and on the other hand to give the theoretical background of the printing technique at all stages of the printing process. In this way we help the visitors of the museum to understand the object-exhibit that they see and moreover to capture these wonderful techniques and to render them in the future.

A collection of objects was created (ROOM A) which includes printing machines (composition and printing), equipment and machine parts, printing cases, synthesizers, metal fonts, wooden fonts, jewelry, strings, tweezers, bookmarks, etc. which represent what we call traditional typography. All these showpieces present the course of the art of typography through the public character of the printing technique.

Another **very important** part of this museum is the library of old Government Gazettes of the National Printing House (ROOM B). This includes the series of Government Gazettes from 1833. Also the Library of publications E.T. (ROOM C), where there is the series of books and notes of the School of Typography of the National Printing House (N.2065 / 1952), books of fellow typographers on topics related to typography, titles related to typography and its evolution, printing works ( books, brochures, publications, posters, etc.) that were printed to meet the needs of the Greek State, books that referred to national purposes (folklore, geography, etc.) that were printed at the National Printing House. There are also records kept **in-house**, such as the records concerning its staff, equipment and building, as well as studies of any kind for the National Printing House.

The collection dates from the mid-1860s until the completion of the prevalence of electronic printing of the National Printing House, around 1990.

The Museum is housed on the top floor of the building of the National Printing House towards Solomou Street, next to the "GOUTEMBERGIOS" hall.

The exhibits are of educational and historical interest as they enable the visitors of the museum to be able to follow the evolution of this invention in combination with the objects, machines and tools of this wonderful art.

## Vetus liber renasciture: The Rebirth of an Old Book for our Students Future

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### ABSTRACT

Since the advent of printing, the creation of the book has remained prosperous and vast. From the moment that Gutenberg presented the magnificently printed sheets of the 42-line Bible on the desk of Enea Silvio Bartolomeo Piccolomini (later to become Pope Pius II), the evolution of a *bibliomania* culture began. Known as *incunabula*, books printed using movable type between the years of 1455 to 1501 were highly coveted. The "swaddled and protected" works of art, were responsible for the development of an entire industry comprised of the book printing trades and the various network of services that rapidly supplied them. Throughout centuries, the book became synonymous with knowledge, theology, education, and classical literature and, through advances in printing technol-

ogy they became more and more readily available and affordable to all people. Unfortunately, as time commenced, and volumes of mass-produced books saturating the market, the value of the book has diminished. Consequently, as the market for digital copies of books gain favor and ease of access, the need and desire of the printed book has remained challenged and diminished. Moreover, as libraries begin to build their electronic databases and rethink their ROI on valuable floor space, many books are being removed, sold, permanently stored, and/or discarded. Fortunately, libraries are maintaining their rare book and special collections divisions. Collections such as these are rare and valuable, however, with such a status are often difficult to access and usually made available to predominantly scholars who can prove their academic credentials or exhibit their research endeavors. Similarly, many rare and special books are being acquired by private estates and placed within massive libraries not admissible to the public. It can be said that many libraries (and some private estates) have painstakingly digitized a lot of these “great works,” as can the efforts of Google Books be duly recognized for their attempt to scan over 25 million books (not yet completed). But through these transitions, the key question arises, what happens to the ability to actually physically exam a beautifully bound and meticulously printed old/rare book set and printed with metal type on individual sheets of linen paper during a represented time of historical significance?

It is up to graphic communication educational institutions and organizations today to acquire and exhibit the works from the very industry from which we have evolved. It is up to graphic communication educational institutions and organizations to provide the physical access to our students of the future. Because if we do not, then the appreciation for understanding sources (in the form of manuscripts, letters, and notes); the respect for the translations of said sources; the meticulousness in labor associated with the making and setting of the type; the inking of the press and the pulling of levers of the press; the collation of the signatures; the artistry in the binding; and, the provenance associated with every human hand that ever touched the book; all—today—get lost in the “click” and electronic screen.

This paper is presented as a call for graphic communication educational institutions across the globe to take back our history through the procurement of an old/rare printed book (1455-1750). The purpose of this call-to-action is to provide an opportunity for students of graphic communication to conduct analysis on actual historical specimens/artifacts with regards to physical properties, printing and publishing data, content analysis and author, and historical provenance. It is desirable that each participating school be invited to document their discoveries in an international website/database and present their findings at an international virtual conference. In a discipline that bases its existence on the printed word, it is important that historical beauty of the book not be lost in a digital world. It is time to activate the rebirth of the old book. *Vetus liber renasciture.*



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