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Journal of Print and Media Technology Research

Scientific contributions

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Exploring social media fatigue among youth in the United Arab Emirates Marian S. Y. Al-Jallad and Ahmed Farouk Radwan

The implementation of a new pop cosmopolitanism concept in the process of mediatization of Japanese mass culture Bogdan Pashchenko, Oksana Kyrylova, Victoriia Pavlenko and Neliia Blynova



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A letter from the Editor

Gorazd Golob Editor-in-Chief E-mail: gorazd.golob@jpmtr.org journal@iarigai.org Due to some delay, the present issue is entitled as the September-October issue. The three papers accepted for publication are covering technical aspects as well as »new« media challenges and also authors are coming from quite different geographic regions.

In the first, original scientific paper, the innovative 3D printing methods are presented for production of sleeves for the printing industry. The basic idea was already previously known, however, authors presented their original and experimentally approved idea, and successfully realized some products on a lab scale.

Research of social media fatigue among youth from the United Arab Emirates, presented in the second paper, shows the correlations between this phenomena and its technological and psychosocial antecedents, as well as its consequences on young users of today's prevalent way of their social interactions.

The third paper is a case study dealing with the mediatization of Japanese mass culture and the exchange and convergence with Western and other cultures leading to a new pop cosmopolitanism concept.

The Topicalities, edited by Markéta Držková (marketa.drzkova@jpmtr.org) are bringing an overview of the reconfirmed and in the last year newly accepted standards in the field of Graphic technology, in the responsibility of ISO Technical Committee 130. On the bookshelf, the reader can find a comprehensive list of books from the fields covered by the Journal, together with a short description of the content and some bibliographic information. The list begins with a book on the modern revolution in book publishing, continuing with books on photography, media management, 3D printing, print history, visual guide to scientific presentation, and concludes with the books on materials and surface science.

The presentation of three significant theses from the field is also a traditional part of the Bookshelf. The first one was defended by Pauline Hibon at the Technical University of Darmstadt, Germany. She was studying the interface stabilities of cross-linked printed films used in printed organic light-emitting diodes.

Nicholas Xavier Williams defended his thesis at the Duke University, Durham, North Carolina, USA. His research was oriented towards custom inks and printing processes for electronic biosensing devices.

Kai Lankinen defended his thesis at Tampere University, Finland. His research topic was the evaluation of expanded gamut printing in flexography, the promising conventional printing technology with many new challenges in research, applications, and standardization. In the Events section, an overview of current and forthcoming conferences, summits, and fairs is presented. The number of listed events is longer in comparison to the one in the previous issue, however, due to pandemics, some organizers are offering online participation, at least as an option.

Some changes in the Editorial Board and Scientific Advisory Board of the Journal were discussed in past months and at the iarigai Conference in Athens. On this occasion, I would like to inform our readers, with regret and some delay, that Björn Kruse, the member of the Scientific Advisory Board of the Journal and a strong promoter of the Journal and other research and publishing activities in our community, passed away.

After the iarigai International Research Conference in Athens, some interesting original scientific or research papers for publication were promised, and even more are expected. Even if you missed the option to attend the conference, you are invited to submit your manuscript for review and publication in the Journal.

Ljubljana, October 2021

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Improving 3D printing methods to create versatile sleeves for the printing industry

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Abstract

In this work we show a method to produce sleeves for the printing industry by utilizing a modified 3D printer. The modification enables the printing process to take place on a rotating cylindrical surface. Due to this modification the corresponding G-code is generated by a MATLAB program. The advantage of this G-code based workflow, as we refer, is the inclusion of the sleeve dimensioning process, and the independence from generalized slicer algorithms providing the freedom to design every layer in respect to mechanical requirements. The motivation behind combining the ability to print on a cylindrical printing surface with the G-code based workflow is to increase the stability of 3D-printed sleeves in relation to their usage in the printing industry. The sleeves themselves consist of required elements, such as top layer and bottom layer, infill layer and air ducts. Our method allows load-appropriate extrusion orientation and therefore gives an additional choice to the common 3D printing workflow adopting Cartesian coordinates.

Keywords: additive manufacturing, G-code based workflow, rotating cylindrical surface, printing industry sleeves, cylindrical coordinate 3D printing

1. Introduction

In this paper we show a new method to produce sleeves for the printing industry. Sleeves in general are pipes of different wall thickness and often consist of layers of different materials in the radial direction. By this construct, they can fulfill requirements for rigidity, price, weight, precision, cut resistance, stickiness, viscoelasticity and so on. Sleeves are used very often in flexographic printing machines as plate cylinders or carriers for the plate cylinder. They are mounted on so-called air mandrels, lubricated by an air film blown out through small orifices on the cylinder's face. First, the sleeve is expanded in diameter by the air pressure and therefore can glide on the air mandrel. After switching off the air, the sleeve shrinks onto the air mandrel. In general, under the conditions of printing the sleeve then stays in its place. Sleeves have a number of advantages which have made them a common part of flexographic printing machines through the past 30 years. They are also used as so-called adapter sleeves to cover a larger diameter span with one air mandrel diameter. In such cases they function as an intermediate part between

air mandrel and printing sleeve and often carry additional air guiding pipes internally to allow the mounting of the external printing sleeves.

Most commonly, the sleeves consist of different materials distributed radially, such as fiber-enforced epoxy resin, polyurethane materials with different densities, viscoelastic materials and so on. We want to present a different method for sleeve construction based on 3D printing with thermoplastic materials. The idea behind this is that different densities of any sleeve material can be reached easily by the control of the extruded path. A large number of 3D printers are available today; some of them are very well documented/open source and need only small changes for our purpose. These printers in general create their output in Cartesian coordinates layer by layer or slice by slice in the *z*-direction. There is a general workflow from the 3D model (given as STL- or OBJ-file) to the extruded path description (in G-code), which allows some influence but, for example, guiding the extruded path in the direction of expected mechanical stress is not possible within this limited workflow.



Figure 1: The structure and the basic layers of the 3D printed sleeves

Our approach is based on a cylindrical coordinate system, a cylindrical printing surface and a self-written software. The software generates G-code which is specialized to 3D-printed sleeves on a structurally changed commonly available type of Fused Filament Modeling (FFM) printer. The internal software of the printer, the so-called firmware, is not changed. To generate the necessary G-code we use the computer algebra system MATLAB (MathWorks, 2021), which allows for writing and storing of programs as M-files. The G-code is generated based on the sleeve dimensions defined by the user. Figure 1 shows the structure and the basic layers of each sleeve, namely the bottom layer, the infill layer, and the top layer. Each of these layers is built up from several printing layers. The printing plate itself is not a part of our 3D printing process as we concentrate on the production of adapter sleeves.

2. Previous work

At a past drupa, the company Leapfrog demonstrated the Xcel Leapfrog (released in 2016) for the production of sleeves by 3D printing (Leapfrog, 2020; 2021). The sleeves exhibited at the drupa consisted of a cylindrical outer shell and a cylindrical inner shell both connected by struts in an axial direction. Their printed sleeves seemed to meet requirements such as light weight and easy customization in diameters and lengths. However, these sleeves are produced by using a general 3D printing workflow, that is to say, the sleeves are printed in the axial direction layer by layer using a Cartesian coordinate system. It could be argued that printing layers in an axial direction of the sleeve.

Elsey (2011) describes a method to print cylindrical objects on a rotating cylindrical surface. A printer was proposed that uses a cylinder as a printing bed and an applicator to place the object forming material layer by layer in a circumferential direction. Smid (2008) gives an introduction to G-code for the control of NC-machines. Zheng, et al. (2019) shows a method to create G-code from programming.

3. Methods

The 3D printer taken for this work is a Geeetech Prusa I3A Pro (Shenzhen Getech Technology, 2016). Originally built from a kit, it was left from another project. The Prusa construction is a kind of portal robot, linked with the person of Josef Prusa, who brought it into the world of 3D-enthusiasts and thus became the identifier for this type of printer. The Shenzhen Getech Technology (2021) is a Chinese company that offers this type of printer worldwide. The printer and its components are controlled by a microcontroller. Its firmware interprets and executes the Marlin subset of G-code commands (Lahteine, et al., 2020). We exclusively use polylactid acid (PLA) filament for our prints and have not done any further experiments related to the material itself. This is due to the fact that the focus of our work is the printing device and the implementation of the G-code based workflow. Still the usage or combination of different available materials keeps the possibility open to enhance specific properties of a sleeve.

The modification of the 3D printer is described in section 4.2. As mentioned before, we used the software MATLAB to write our G-code generator. To visualize and validate the generated G-code we used Repetier-Host (Hot-World, 2021). Repetier-Host is a slicer software and is usually used to generate and analyze G-code for 3D printing systems with a Cartesian coordinate system.

4. Developing of cylindrical printer and sleeves

The G-code-based workflow from our approach simplifies the computer aided sleeve dimensioning process to a limited number of user-defined parameters which are directly processed into well-optimized G-code (detailed in 4.1). As a first step, we modified a Geeetech Prusa I3A Pro printer to meet the needs of cylindrical coordinates (4.2). Then we wrote the mentioned software by defining crucial parameters to describe a single sleeve and by using selected G-code commands (4.3). Furthermore, we applied a commonly used model for calculating the filament length to be fed into the extruder for printing an extruded path of a given length (4.4). We used the same model to ensure an even and closed surface by overlapping every extruded path with its adjacent paths (4.4). After that we finally gained all tools to write our G-code generator. Its core processes are the implementation of sleeves in a cylindrical coordinate system (4.5) as well as the implementation of the different basic layers of sleeves and the needed air ducts (4.6).

4.1 The G-code based workflow and the advantages of cylindrical coordinates

The core element of our approach is the G-code based workflow as shown in Figure 2. The conventional workflow strictly separates the creation of a 3D object from the generalized G-code generation. The G-code based workflow reduces the dimensioning process to the key parameters of the object, in our case the sleeve. As a result, it concentrates on an application-optimized and therefore specialized G-code generation for an also application-optimized 3D printer.

Therefore, the first step of the G-code based workflow is the sleeve dimensioning process. It starts with opening the main_function.m script in MATLAB ((1) in Figure 3) and its execution (2) in Figure 3). In the command window ((3) in Figure 3) the user will see prompts ((4)in Figure 3) that guide one through the whole dimensioning process. The prompts actually ask the user to define each parameter for a sleeve, such as length of the sleeve, thickness of top layer, angles of the extruded bands for each printing layer and so on. A full list of the user-definable parameters can be seen in Table 1. By varying these parameters, the user can customize the sleeve to his or her needs. The user defined parameters will be sent back to the program and a G-code file will be created after the last prompt has been answered. The save path of the G-code file can be changed directly in our MATLAB script ((5) in Figure 3). In this example



Figure 3: The GUI of MATLAB and an example of a user input (dotted rectangle) as reaction on a prompt from the program on the command window

the G-code file is named "Sleeve.gcode" and is saved to the hard disk drive D. The software is very simple in its structure and is mainly designed to work in laboratory application.

Table 1: Sleeve parameters and their meanings

Parameter	Definition
eb	Width of infill layer [mm]
α	Angle of infill layer [°]
L	Length of sleeve [mm]
Н	Thickness of sleeve [mm]
D	Diameter of printing cylinder [mm]
0	Overlap distance [mm]
β	Angle of printed top and bottom layers [°]
D_A_H	Thickness of top layer [mm]
D_I_H	Thickness of bottom layer [mm]

As a next step, we use Repetier-Host to visualize and validate the G-code file. It appears as a flat printed model because the software environment to process our G-code is left untouched. The only exception is the flat bed size in the *x*-direction, which must have the ability to take up several revolutions of the cylindrical printing surface. On a flatbed printer without our modification the printout would appear as shown in Figure 2. Herein it simply saved us from writing our own visualization software. The code can then be sent either directly from the PC to the 3D printer managed by Repetier-Host or by inserting an SD card with the G-code in the 3D printer. Finally, the 3D printer interprets the G-Code and prints the sleeve. As Cartesian coordinate 3D printers print any object from bottom to top, layer by layer they are not well suited to print a cylindrical object with its center axis parallel to the x-y-plane. Support material necessary for overhanging parts has to be printed and then later removed again. The G-code-based workflow could create these kinds of objects in combination with a necessary mechanical change of the printer. In addition to this, it gives us full control over the extrusion path in terms of orientation, temperature, speed, and so on, which cannot be achieved by a standard slicing workflow.

A sleeve manufactured on a Cartesian coordinate system printer will have different mechanical properties depending on slicing parameters and special arrangement of the sleeve. As a result, it may become weak in certain load situations or even change mechanical properties like stiffness with the angle of rotation. If the layers of a sleeve could be printed on a cylindrical surface, each layer would correspond to the circumference for a specific radius. Furthermore, if each layer could be printed following any direction between circumferential to the axial direction, this would allow alternating spiral helical applied layers. As a result, the only major weakness may be the connection from one laver to the next. This we consider to be a minor problem as the stress in the printing machine would be mainly compressive rather than tensile.

4.2 Modifying a Cartesian coordinate system 3D printer to operate with a cylindrical coordinate system

In the following, we describe how to implement sleeves in a cylindrical coordinate system and how we modified a Cartesian coordinate system 3D printer to operate with a cylindrical coordinate system.

In the Cartesian coordinate system (Figure 4a) the extruder moves on smooth rods horizontally and is driven by a toothed belt to realize the *x*-axis. The printing bed moves perpendicular to the *x*-axis horizontally along the *y*-axis. The two vertical screw rods control the *z*-axis. Contrary to Cartesian coordinates, cylindrical coordinates consist of a radial (*r*), an azimuthal (θ) and a linear (*l*) component.

To implement these components our modifications (Figure 4b) leaves the *y*-axis and the *z*-axis mechanically unchanged from the Cartesian coordinate system. The difference is that the former *z*-axis now controls the *r*-component of the cylindrical coordinate system, while the former *y*-axis controls the *l*-component. To implement the θ -component, the printing bed is now designed as a rotating fiber-reinforced plastic (FRP)



Figure 4: (a) Cartesian coordinate system before, and (b) cylindrical coordinate system after modification of the 3D prnter



FRP printing cylinder Gear with 12 teeth Former stepper motor of the *x*-axis controls the θ -component

Figure 5: Modified Geeetech Prusa I3A Pro with mounted FRP printing cylinder and 1:5 gearbox

printing cylinder carried by the former printing platform. As the FRP printing cylinder is driven by the former *x*-axis motor, the former *x*-axis controls the θ -component. The extruder is kept fixed above the top center line of the FRP printing cylinder.

In contrast to the formerly limited build area, the cylindrical printing surface is virtually infinite in circumferential direction (formerly: *x*-direction). By that, seamless objects and also free choice of angle for extruded paths are possible. Practically it can also save time because for a repositioning of the extruder in circumferential direction the maximum distance is always less than, or maximally, one-half circumference.

In practice we modified a Geeetech Prusa I3A Pro as shown in Figure 5. The printing bed was replaced by an FRP printing cylinder mounting system. This system can be mounted with a FRP sleeve with a diameter of 79 mm, which complies with the standard basic FRPsleeves used in the industry. In our case they serve as a changeable printing cylinder.

A stepper motor (200 steps/rev., 32 microsteps each) drives the FRP printing cylinder via a gearbox. The gear ratio of 5 ensures a circumferential resolution of 0.00776 mm/microstep (Equation [1]) which is approximately equivalent to the given axial resolution. Furthermore, the gearbox was built in to keep accuracy with increasing diameters and to avoid problems from the larger inertia of the FRP printing cylinder or additional mechanical system.

$$Res_{cf} = \frac{d_{pc} \times \pi}{st_{res} \times mst \times gr}$$
[1]

where Res_{cf} indicates a circumferential resolution [mm/microstep], d_{pc} is a diameter of an FRP printing cylinder [mm], st_{res} is a stepper resolution [steps/revolution], *mst* denotes a microstepping [microsteps/step], and *gr* indicates a gear ratio.

4.3 G-code and relevant commands

G-code is a CNC programming language used for many different types of NC machines. The command set depends on the type of machine and the implemented hardware. The unmodified Geeetech Prusa I3A Pro uses the so-called Marlin firmware. A description of the included commands is documented on the Marlin website (Lahteine, et al., 2020). A general G-code command consists of a letter which stands for a group of commands (e.g., G for standard commands like movement or T for tool related commands) most often followed by a number which specifies the command. Table 2 shows basic G-code commands most commonly used to control Cartesian coordinate system printers.

Table 2: Basic commands with definitions of commands with variables of G-code

-	
Command	Definition
G1	Extruder goes straight
F	Printing speed F [mm/min]
Х	Coordinate X in x-axis [mm]
	(Cartesian coordinates)
Y	Coordinate Y in y-axis [mm]
	(Cartesian coordinates)
Z	Coordinate Z in z-axis [mm]
	(Cartesian coordinates)
Е	Extruded length <i>E</i> [mm]

On a flat printing bed, the G-code text in Table 3 appears as parallel lines (Figure 6) with layer height h = 0.2 mm. The extruder locates at coordinate (0, 50) first, then prints to coordinate (248, 50) with a speed of F = 800 mm/min while feeding E = 7.4 mm filament into the extruder. Next, the extruder travels quickly to a new position (0, 150) with a speed of F = 1500 mm/min. Finally, a parallel line from coordinate (0, 150) to coordinate (248, 150) is printed with identical parameters to those of the first line.



Table 3: Example of G-code

G1 Z0.2	; Positioning
G1 X0 Y50 F800	; Positioning
G1 X248 Y50 E7.4 F800	; Printing
G1 X0 Y150 F1500	; Positioning
G1 X0 Y150 F1500	; Positioning
G1 X248 Y150 E14.8 F800	: Printing
	,

As mentioned before, the firmware of our 3D printer is unchanged. As a consequence, we have to use these Cartesian coordinate system-based G-code commands to control our cylindrical coordinate system-based 3D printer. Therefore, we assume the printing surface of the FRP cylinder to be a plane with a finite height (*l*-component) and an infinite width (θ -component). So, we are still using Cartesian coordinates for calculating the G-code commands for each printing layer.

As the circumference raises with each printing layer (given by the *r*-component), we calculate each printing layer based on the current circumference. If one printing layer layout remains unchanged, we iteratively scale the results and the parameters up to the next printing layer (see section 4.5).

4.4 Calculating the extruded length and the overlap between two extruded paths

Figure 7 shows names and variables of the extruder and the extruded band. The extruded length *E* depends on the diameter of the filament d_f and the length *l*, width *b* and thickness *h* of the extruded path.

Assuming a constant material density before and after extrusion we calculate the *E* value by use of Equation [2] as part of the model described by Hodgson, Ranellucci and Moe (2019), which we explain as follows:

$$E = \frac{V_{\rm b}}{\pi (d_{\rm f}/2)^2}$$
[2]

where *E* denotes the extruded length [mm], V_b is a volume of extruded band [mm³], and d_f is a diameter of filament [mm].

The width b of a single extruded band can vary from values near the nozzle diameter up to wider values. The maximum width depends on the quality in terms of smooth and even surface of the band. Figure 8 shows different widths of an extruded band and a structure formed by several bands.

The cross section of the extruded path is not rectangular but shaped as shown in Figure 9a. It appears like a rectangle in the center with two semicircles on the sides. The volume $V_{\rm P}$ of the extruded path is calculated as shown in Equation [3]:

$$V_{\rm p} = l[\pi(h/2)^2 + h(b-h)]$$
[3]

with *h*, *b* and *l* as shown in Figures 7, 8, and 9.

If two extruded paths are printed side by side without overlapping, there will be a gap between them shown as area (1) in Figure 9b. To solve this towards a more



Figure 7: Extruder and extruded band



Figure 8: (a) A band with a width near to the extruder's nozzle diameter, (b) an over-squeezed band, (c) a combination of several paths printed in parallel to form a wider structure



Figure 9: (a) Cross section of one extruded path, (b) two extruded paths without overlap, (c) two extruded paths with accurate overlap to get a more even and closed surface

even surface there should be some overlap (area (2) in Figure 9c), so that the overlap area equals the gap area (area (3) in Figure 9c). The overlap distance *O* is calculated by Equation [4]. The value depends only on the layer of extruded filament thickness (height of printing layer) *h* [mm] (Hodgson, Ranellucci and Moe, 2019).

$$0 = h - \frac{\pi (h/2)^2}{h}$$
 [4]

4.5 Dynamic parameters depending on layer

For each extruded band in the first printing layer the extruded length is calculated as described before (4.4). Because of the cylindrical coordinates some parameters depend on the current printing layer. By changing the *r*-component from one layer to the next the diameter and perimeter of the rotating surface also changes. We have to consider the extruded length and printing speed at identical angular positions in different printing layers.

Figure 10 illustrates the increase in length for each new printing layer. Therefore, we iteratively calculate the extruded length (extruded material) for the current printing layer based on the previous layer as shown in Equation [5].

$$E_{n+1} = E_n \frac{D + 2h(n+1)}{D + 2hn}$$
[5]

where E_n denotes the extruded length of the *n*th printing layer [mm], and E_{n+1} is extruded length of the (*n*+1)th printing layer [mm], accordingly.

In 3D printing with FFM printers an increasing printing speed generally has a decreased print quality as a result. Therefore, the growing perimeter should be considered in a way that the extruder can travel at the same surface speed on each radius.

Equation [6] shows the calculation of an adapted printing speed.

$$F_{n+1} = F_n \frac{D + 2hn}{D + 2h(n+1)}$$
[6]

where F_n denotes printing speed of the *n*th printing layer [mm/min], and F_{n+1} is printing speed of the (*n*+1)th printing layer [mm/min], accordingly.

Figure 11 illustrates how the extruded length of an infill path E_i depends on the infill angle α . By Equation [7], we calculate the length of an infill path l_i (dashed red line in Figure 11).

According to Equations [2] and [3], the extruded length depends on the length of the extruded path. Therefore, the length of an infill path l_i also determines the extruded length of infill E_i . This extruded length E_i will be increased proportionally to the growing *r*-component and is calculated printing layer by printing layer similarly to Equation [5].

$$l_i = \frac{L}{\sin\left(\alpha\right)}$$
[7]

where *L* denotes the length of sleeve [mm], α is the angle of infill layer [°], and l_i is the length of infill layer [mm].



Figure 10: Dynamic extruded length for circumference and printing speed in cylindrical coordinate system

4.6 The structure of the basic layers and the air ducts

The sleeves consist of a top layer, a bottom layer and an infill layer, which includes air ducts in the case of adapter sleeves (see Figure 1). The following sections will explain each basic layer in more detail. 4.6.1 Top layer and bottom layer

The top layer and the bottom layer should be 100 % material. The top layer is the outside hull of a sleeve. The bottom layer is the inside hull of a sleeve (shown with white filling in Figure 1 and printed out in Figure 12). Together with the front face and the back



Figure 11: Angle, length and extruded length of single infill



Figure 12: Four different angles of the extruded bands for the top layer during the printing process (left images) and the schematic (right image) with related parameters, for parameter descriptions see Table 1



Figure 13: Schematic with infill related parameters (left image) and the printed infill with included air ducts (right images), for parameter descriptions see Table 1

face of the sleeve they build a totally enclosed body. To adjust the stability, we could use several layers to build the bottom layer and top layer. Furthermore, the angle of the extruded bands α can vary between each layer. We define $\alpha = 0^{\circ}$ to be in the circumferential direction and $\alpha = 90^{\circ}$ to be in the axial direction. The angle can be freely selected in MATLAB and the angles can be defined as a sequence for successive printing layers. The top layer and bottom layer will then be printed following the defined sequence.

4.6.2 Infill

The infill, shown with gray filling in Figure 1 and printed out in Figure 13, connects the top layer with the bottom layer. The infill is enclosed by the bottom layer, the top layer and the front face and the back face of the sleeve. Its main function is to save weight and material while delivering enough support for the top layer. The infill can be defined with any angle or sequence of angles and any necessary built-up area.

4.6.3 Air ducts

The printing sleeves in flexographic printing machines need an air cushion to be mounted as mentioned in the introduction to this paper. If there is an adapter sleeve between the air mandrel and the printing sleeve, some systems deliver the necessary air for the air cushion by air ducts through the adapter sleeve. In our MATLAB program, the air ducts can be defined in axial, radial and circumferential directions as shown in Figures 1 and 13.

5. Results

Our main result is a simple way to implement a 3D printer based on cylindrical coordinates with the corresponding G-code generator specialized for sleeves. One of the key elements of this implementation is the

software for dimensioning the desired sleeves within the intended limitations. Beyond the outer dimensions of the sleeve the extruded bands angle of each printing layer is user-definable to fit mechanical needs. Based on the user-defined parameters the software automatically generates the corresponding G-code. The other key element is the modified 3D printer that interprets the G-code to produce the sleeves. As we described the results as parts of section 4 we just want to refer to the corresponding subsections that are solely our work. The whole workflow in general is described in section 4.1. The way we modified a cartesian coordinate system 3D printer to work with a cylindrical coordinate system we discussed in section 4.2. The structure of the 3D printed sleeve and the needed calculations are presented in sections 4.5 and 4.6.

6. Conclusion and future work

Recent 3D printers permit the creation of a large variety of objects. For some objects with special demands like sleeves, a less generalized and more specialized workflow in combination with a specialized 3D printer would be preferable.

In this work, we proved that this concept is fairly simple to implement. We modified a Geeetech Prusa I3A Pro FFM printer with a stepper driven FRP printing cylinder as a replacement for the *x*-axis. We provided a method based on the modified 3D printer to have additional choices for printing sleeves. We ignore the conventional workflow and develop the sleeves on a rotating surface directly via a G-code-based workflow. The matched MATLAB program allows to print a sleeve without programming within the foreseen limits. The method is suitable for the given task and will serve as a tool to optimize 3D printed sleeves.

With our work we aim not only for printing sleeves but also for adapter sleeves with imprinted air ducts. The option for air ducts is currently only implemented in principle and not adapted to a specific system.

Our future work will follow different ideas. One is to build a more professional sleeve printing device with increased 3D printing speed to produce sleeves for narrow web printing machines. In terms of sleeve variation, we have a large number of material options, post processing options and structural design options. Also, so far, we have only focused on the proof of concept – the next step will be to use a sleeve inside a flexographic machine.

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Exploring social media fatigue among youth in the United Arab Emirates

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Abstract

Social media fatigue (SMF) has emerged as a recent phenomenon by which social media users feel fatigued and exhausted as a result of the great amount of technological and psychosocial pressures they are exposed to online, consequently, affecting their psychological well-being. Therefore, this study explores the antecedents and consequences of SMF among young adults in the United Arab Emirates through a cross-sectional study with 350 users. From the lens of the stressor–strain–outcome framework, cognitive load theory, and selective exposure and selective avoidance theory, our study explores the relationship between the antecedents: three technological factors (information overload, system-feature overload, and privacy concerns), three psychosocial factors (fear of missing out, self-disclosure, and social comparison) and SMF. Additionally, the study explores the behavioral consequences resulting from SMF such as discontinued use, switching intention, and the proper coping mechanisms that social media users utilize when experiencing SMF. The empirical results show that the technological and psychosocial antecedents are significantly positively correlated with SMF. Furthermore, users who experience SMF engage in different usage behaviors including discontinued use, willingness to switch, and utilize coping mechanisms when they are exposed to SMF.

Keywords: information overload, fear of missing out, social comparison, switching intention, coping mechanisms

1. Introduction

With the diffusion of information and communication technologies and the development of media technology, the ability to communicate with others has been immense in both time and space. The proliferation of social media platforms has enabled people to create social bonds, share information, and enjoy the technological aspects of communication mediums virtually in a click of a button. However, this intensive use has created different types of pressure and overloads among social media users (Dhir, et al., 2019). These overloads vary from psychosocial overloads, which require the user to engage in the virtual social setting and practice their social role online, to the various technological overloads, which require the user to remain updated with new information, events, new updates and technological releases (Lee, Son and Kim, 2016). Thus, social media fatigue (SMF) can occur because of the constant pressure and overloads that individuals encounter on a daily basis. Social media fatigue is the feeling of tiredness and exhaustion that online users develop when they experience overloads caused by the extensive

use of social media (Xiao and Mou, 2019). This fatigue develops several behavioral implications among social networking sites (SNS) users such as the desire to take a break from social media, which some refer to as a "digital detox", either by reducing the frequency of usage of the social media platforms or discontinuing their usage forever (Nawaz, et al., 2018). Because many people find it difficult to discontinue their social media use, they refer to switching behaviors that include migrating from one platform to another (Hou and Shiau, 2019), or use a number of coping mechanisms, which can help them control the amount of fatigue they feel from the extensive use of SNS and platforms (Lee, Son and Kim, 2016).

Prior literature has shown that social media pressures are positively related to SMF causing multiple psychological and behavioral implications. However, data regarding the technological and psychosocial overloads influencing the SMF is limited in the Arab context, specifically in the context of the United Arab Emirates (UAE). The present study explores this recent phenomenon by examining the factors (overloads) that induce the fatigue among young adults in the UAE, compare between demographic variables, e.g., gender, age, daily hours spent on social media, and years of experiencing SMF. Furthermore, this study aims to explore the coping mechanisms that the young adults use to cope with this exhaustion and fatigue resulting from SNS use.

1.1 The significance of the study

The intention of this study is to provide theoretical and practical contributions to the fields of communication, sociology, and psychology. As for the theoretical contributions, past studies have studied the discontinuance behavior of social media as an implication of the SNS fatigue. Yet, there is hardly any study that highlights the coping mechanisms that users adopt to control the feeling of stress as a possible implication of the SMF from the perspective of communication drawing on the theory of selective exposure and selective avoidance. Thus, this study aims to fill the gap in the literature by exploring the coping mechanisms that users adopt to adapt to the exhaustion. Second, it is not yet clear what impact SMF has on the users' switching intention. Thus, this study aims to clarify the user's migration from one platform to the other as a result of SMF. Third, past studies have focused on the positive aspects of social media usage, the patterns of use, and the gratifications obtained from this use, whereas this study aims to give a balanced perspective on social media use by highlighting the negative aspects of the intensive use which is SMF. Fourth, most of the studies that explored stress and fatigue resulting from social media use have adopted theoretical concepts embedded in psychology, while this research will use, in addition to two commonly used theories, the selective exposure theory, which is originated from psychology but widely used in communication and media research that none of the past studies have explored.

As for the practical contribution, young adults and other users will benefit from this study by identifying the SMF phenomenon and how extensive use of social media can trigger stress, exhaustion and depletion of energy levels as well as discussing the coping mechanisms, which the users can adopt to control the exhaustion resulting from the overload. It is also significant for social media designers to consider adding more features which can help the users control the excessive use and avoid the overload.

This research aims to explore the SMF phenomenon among the youth in UAE, the technological factors and psychosocial factors that trigger SMF, the differences between the demographic variables in experiencing SMF, and the different implications resulting from SMF among young adults.

2. Theoretical framework

2.1 The stressor-strain-outcome framework

The stressor-strain-outcome (SSO) framework was established initially to explore the relationship between work-induced stress and the mental well-being organizations (Dhir, et al., 2019). Also, it has been widely used in understanding the antecedents and consequences of technostress (Nawaz, et al., 2018; Fu, et al., 2020). Therefore, the SSO framework is adopted to explore how the antecedents (pre-existing technological and psychosocial factors) cause SMF and the behavioral implications resulting from this fatigue, e.g., discontinued behavior, switching intention and coping mechanisms of SMF. This model has three essential elements: The stressor(s), strain, and outcomes(s). The *stressors* are typically any factors, stimulators or causes that cause a problem, or a stressful situation. This stressful situation can be referred to as the *strain*, which induces certain outcomes that can inhibit the individual's physiological, psychological, and cognitive processes. For example, users who compulsively use social media are prone to tiredness, emotional instability, and weariness from the platforms. Thus, they will either engage in behaviors that can reduce the stress they feel such as discontinuing their use temporarily or permanently, switch their use from the platform that causes the most stress, or/and adapt with this fatigue using several coping mechanisms either by actively choosing to control the fatigue by monitoring their use, or continuing to use social media without any proactive measure or willingness to change the stressful situation even when they are in the fatigued state.

2.2 Cognitive load theory

The cognitive load theory (CLT) is coined in the work of Sweller (1988, cited in Islam, et al., 2020, p. 4), which presumes that "the human working memory has a limited capacity which may be overloaded if presented with too much information". According to previous studies (Xiao and Mou, 2019; Cao, et al., 2019), CLT can be useful in demonstrating how certain overloads and factors can lead to cognitive loads of the human working mind. These factors vary from fear of missing out, anxiety, online social comparisons, technological factors embedded in technologies, devices and social media, privacy concerns, etc. (Islam, et al., 2020). Thus, this theory can help explain the technological and psychosocial factors that induce SMF.

2.3 Selective exposure

The selective exposure theory is a notion that is widely used in communication research, which refers to the individual's likelihood to select information that reinforces their personal views, perspectives, attitudes, and values while avoiding any conflicting information (McLennan, 1970). According to this theory, individuals are more likely to expose themselves to information that they perceive favorable, while at the same time ignore unfavorable information. Selective exposure can take different forms: (1) selective exposure to news or entertainment, (2) selective exposure to different issues or events, and (3) selective exposure to certain communication medium. Stroud (2018) offers an overview on a few possibilities of why selective exposure occurs among the individuals. Selective exposure can happen when a person is exposed to conflicting ideas or information, and to resolve this conflict, he/she tends to select information based on their pre-existent beliefs. Another explanation is that processing likeminded information reduces the number of cognitive processes by the individual. In other words, individuals will spend less effort when selecting like-minded information because it is "cognitively easier" (Stroud, 2018, p. 3). Also, mood and emotions can impact the selective exposure of the individuals. For example, when individuals have negative emotions or are in a negative state of mind, they tend to select information that enhances their mood, and avoid other type of information. Thus, this theory is applicable to our investigation on SMF as this study aims to explore the coping mechanisms (selective exposure and selective avoidance) that social media users adopt when facing social media overloads and fatigue.

2.4 Social media fatigue

Fatigue has been studied in many fields of research including clinical fields, social sciences fields, etc. Clinical research has identified fatigue as the constant feeling of exhaustion and tiredness resulting in decreased levels of physical, cognitive, and emotional abilities (Lian, et al., 2018). While psychology has defined fatigue as the decreasing levels in production as a result of prolonged physical and mental activities, leading to exhaustion and fatigue (Xiao and Mou, 2019).

From the previous definitions, SMF can be identified as the users' overwhelming feelings of tiredness, loss of interest, overloads, pressure, decrease in both needs and motivations of social media use and engagement. It is a "popularized" cultural reference that refers to the users' dissatisfaction with social media, their need to either disconnect, switch the platforms, or cope with this exhaustion (Dhir, et al., 2019). With the expansion of social media applications and the increasing number of their users, the fatigue experience has prevailed across its users leading researchers to investigate this fairly new phenomenon, mainly the antecedents lying behind SMF. In this study, antecedents refer to the possible stressors, overloads, factors and/or causes behind SMF (Dhir, et al., 2019). The literature (Lee, Son and Kim, 2016; Reer, Tang and Quandt, 2019; Xiao and Mou, 2019) divides the main causes of SMF into two types: (1) technological factors (information -overload, system-feature overload, and privacy concerns), and (2) psychosocial factors such as social comparison, fear of missing out, self-disclosure, etc.

For the consequences of SMF, previous and recent literature (Lee, Son and Kim, 2016; Cao and Sun, 2018; Dhir, et al., 2019; Nawaz, et al., 2018; Cao, et al., 2019) has mainly focused on the discontinued use that may occur for either short or long periods of time, or the actual termination of the platform. However, it has not been explored in the social media research context in the Arab region. Furthermore, users' switching intention of the platform and the required coping mechanisms emerge to handle stressful situations (Hou and Shiau, 2019; Xiao and Mou, 2019; Lin, et al., 2021) yet they have not been clearly covered in terms of their relationship with SMF as behavioral implications.

2.5 Technological antecedents as SMF triggers

Although social media provide their users the opportunity to connect, communicate, share knowledge and information, yet it can result in huge amounts of negative overloads when a person is highly exposed to these platforms. In the context of social media, technology overload refers to the imbalance that happens between the unexpected, large number of demands from the social media platforms, and the person's limited ability to cope with all these demands (Xiao and Mou, 2019). When this misfit happens, individuals feel stressed and strained, resulting in the "fatigue" which translates in the discontinued use of social media either for short or long periods of time.

Lee, Son and Kim (2016) conducted a study on 201 students at the University of Yonsei in South Korea to examine the effects of the three above-mentioned factors, which may induce SMF., i.e. (1) information overload, (2) system-feature overload, and (3) privacy concerns. The study showed that the previous overloads have a significant positive relationship with SMF.

2.5.1 Information overload and SMF

Information overload occurs when the user is exposed to large amounts of information and news that is circulated in a fast-paced, non-consecutive order (Dhir, et al., 2019). Social media offers the opportunity for many individuals to create thousands of channels and pages which disseminate different information that can be either irrelevant, fake, advertising materials, and repetitive. This can cause a burden on social media users because they are forced to process the excessive amount of information, which surpasses their processing capability (Nawaz, et al., 2018). Thus, information overload takes place once the excessive amount of information outweighs the individual's needs, impacting their ability to recall important information. This results in the confusion of the user, followed by feelings of stress and fatigue (Nawaz, et al., 2018; Dhir, et al., 2019; Zhang, Ding and Ma, 2020).

2.5.2 System-feature overload and SMF

System-feature overload refers to the overload which social media users face from the continuous technical updates in the features of the social media applications, which users are forced to follow and update frequently (Fu, et al., 2020). Many of these applications will not operate correctly in case they have not been updated. This puts pressure on users to update these applications and adapt to the new features which may be very different from the previous features the platforms had. The continuous changes in the features of the social media application will trigger stress, frustration, and exhaustion among the users (Xiao and Mou, 2019; Fu, et al., 2020).

2.5.3 Privacy concerns and SMF

Privacy factor refers to the continuous presence and connectivity of technology users using their devices without any boundaries or limitations to both space and time (Brivio, et al., 2018). Online privacy is one of the most controversial dimensions related to the safety of the internet and social media platforms. Since personal, financial, and browsing information can be easily compromised through hacking, tracking, or misused by web developers, third party apps, malicious software, and hackers, this sparked controversy on the security of these platforms. Consequently, this leads the users to feel mentally burdened and pressured by their never-ending concerns when they are actively experiencing SMF. Based on prior literature, social media users who have privacy concerns are more likely to experience SMF.

2.6 Psychosocial antecedents as SMF triggers

Social media is a platform that was initially designed to build social connections and establish good relationships with the others. However, users can experience psychological pressures when they are exposed to large amounts of overloads which can endanger one's mental health because of the unrealistic standards that young adults are rushing to meet (Maier, et al., 2015, Kaur, et al., 2021). These demands can vary from one's feeling that they are missing out on important online evets, news, activities, or their constant need to self-disclose themselves by sharing personal photos, mood and emotions online, or comparing themselves to peers and friends in a negative manner for their accomplishments, appearance, social status. Eventually, this leaves the users feeling drained because of the online social pressure they faced (Brivio, et al., 2018). Reer, Tang and Quandt (2019) have highlighted the psychosocial dimensions and factors, which lead to the users' online exhaustion: (1) self-disclosure, (2) social comparison, and (3) fear of missing out.

2.6.1 Self-disclosure

Self-disclosure is an intentional act performed by individuals, in which they reveal some personal information, thoughts, feelings, and personal experiences about themselves to others (Dienlin and Metzger, 2016). Selfdisclosure involves a communication process between one individual who reveals his/her thoughts or feelings to one or more people through verbal and non-verbal cues in offline and online settings (Maier, et al., 2015). In the social media context, users will disclose information about themselves through their personal profile, e.g., hometown, marital status, past experiences, current job, profile picture, etc., or update status about the current events in their lives, which can be either important or irrelevant, share videos, jokes, information, quotes and so on (Malik, et al., 2020).

Motivations behind self-disclosure include many elements like social acceptance, developing and maintaining relationships, relatedness, achievements, and social control (Luo and Hancock, 2020). These elements are crucial for a user to gain certain social benefits. However, users who engage highly in self-disclosure acts on social media are perceived to suffer from social overload. This is because they must keep surfing the platforms' pages and keep on track with feed pages that are filled with activities and posts by either family members, friends, and colleagues. This upkeep can trigger the overload among the users, leading them to have feelings of weariness and fatigue as a result (Dhir, et al., 2019).

2.6.2 Social comparison

Social comparison refers to the individuals' tendency to compare themselves to others either in a positive or negative manner (Verduyn, et al., 2020). With the emerging online social network, recent literature (Latif et al., 2021; Tandon, et al., 2021) has shown that individuals have been more often engaging in the negative form of social comparison especially online, which has raised concerns regarding the psychological well-being of the online users. One of the many reasons behind this is these platforms have created a wide virtual space that allows its users to engage heavily via interactive communication (Rosenthal-von der Pütten., 2019). Furthermore, users can show themselves in an idealized version that at many times does not reflect their real offline personality.

For instance, online users can selectively choose to share the content that reflects the more positive side of their life, e.g., photos, videos, written posts, achievements, which lets others perceive them in a perfect filter (Kaur, et al., 2021). Thus, this perfect perception of the others' lives may trigger negative emotions related to comparing one's life to what they see on social media. This can create stress and exhaustion for the users who actively use social media (Tandon, et al., 2021).

2.6.3 Fear of missing out

Fear of missing out is a psychological concept referring to the feelings that a user will develop because he or she believes others are having more rewarding experiences than him/herself (Chai, et al., 2019). These users will feel overwhelmed when they view their friends or family members engaged in activities they are not involved in, which will lead them to perceive themselves as socially excluded and isolated from the online social circle. Research suggests that individuals who experience fear of missing out are more likely to be immersed in psychological needs of being continuously connected with others, so they do not miss out on what they perceive as important (Kaur, et al., 2021; Tandon, et al., 2021), as people who experience high levels of the fear of missing out are more likely to experience negative psychological and physiological implications. Thus, it is important to explore its relationship with SMF.

2.7 Demographic differences and SMF: gender, age, daily hours and years of experience

Recent literature reveals that there are gender differences in experiencing SMF, as women significantly engage more on SNS than men, and participate in online social activities, which lead them to experience social media overload, thus fatigue (Ji, Ha and Sypher, 2014; Vijayakumar and Pfeifer, 2020). Their extensive participation leads them to engage in more self-disclosure actions such as revealing personal information, feelings, personal pictures, etc. (Eliyana, et al., 2020). They are more likely to show online support to friends and family members and engage in online social activities. Thus, they are more likely to exhibit feelings of SNS exhaustion and fatigue than men. On the contrary, one study (Maier, et al, 2015) found that gender is not correlated with SMF. Young male adults are likely to develop feelings of SNS overload as much as female do. This can be related to the personality characteristics both males and females develop during the transitional phase of adolescence, and their desire to express themselves by creating online profiles through SNS and engaging in self-disclosure acts (Yang and Brown, 2016). Previous studies also emphasized the significance of age in determining the extent of SMF in SNS users (Ji, Ha and Sypher, 2014; Vijayakumar and Pfeifer, 2020). Younger adults seem to engage in the use of SNS for many different purposes such as social engagement, creating online identities, social bonding, expressing one's identity, self-presentation (Eliyana, et al., 2020). The amount of effort and time that young adults devote to stay relevant online triggers SMF. Unlike elders, whose social media use mainly revolves around connecting with only close family and friends, and surfing news pages, as they do not feel the pressure to engage heavily in the online environment: hence, they experience much less overloads (Dhir, et al., 2019). However, the study of Maier, et al. (2015) has also concluded that age along with gender is not correlated with experiencing SMF. One of the justifications behind this is SMF can relate to the volume, intensity, and frequency of social media use.

Furthermore, this study will explore the differences in the nationality as the UAE has more than 202 nationalities residing in the country. Also, the study will examine the differences in the daily hours spent on social media and the years of experience between the young adults experiencing SMF.

2.8 Consequences of SMF

2.8.1 Discontinued behavior as a consequence

The great amount of both technological and psychosocial overloads that SNS users experience might provide an understanding on the possible consequences of SMF. Discontinued use emerges as an important implication, which refers to the willingness of network users to either limit, reduce, or stop their use of certain services for short or long periods of time (Fu, et al., 2020; Nawaz, et al., 2018). This behavior occurs when users are exposed to huge amounts of pressure and stress so they try to regulate these negative feelings by discontinuing their use of social media, which can take many forms, e.g., temporary pause or final termination of social media use. Although previous studies have illustrated how the users' feelings of exhaustion and dissatisfaction emerge as a result of the pressure they face on social media, yet discontinued use of social media has not been explored as a consequence of SMF in the Arab social media context.

2.8.2 Switching intention as a consequence

Switching intention on social media refers to the users' willingness to migrate from one platform to the other due to users' perceived satisfaction or dissatisfaction with the use of a certain platform. This satisfaction is determined by a number of constructs, e.g., socializing, enjoyment, system features and ease of use (Hsu, Yu and Wu, 2014; Wu, et al., 2014; Hou and Shiau, 2019). As opposed to discontinued use of social media, service switching does not require the user to fully abandon the use of social media. Rather, user-switching behavior includes the individuals' migration from one platform to another as a result of the exhaustion and dissatisfaction they might develop from the previous platform (Sun, et al., 2017). What remains unclear is the relationship between SMF and the switching intention of the online users. Thus, this study aims to clarify the user's migration from one platform to the other as a result of SMF.

2.8.3 Coping mechanisms: adaptive and maladaptive coping as a consequence

However, in other cases, the users might develop coping strategies in which they are aware of the amount of exhaustion and overload they experience from SNS use, yet they will adapt with this exhaustion through some mechanisms that make them more comfortable in the use of SNS.

According to Guadioso, et al. (2017), the coping mechanisms can take two forms: adaptive and maladaptive mechanisms. Adaptive mechanisms express the positive strategies that users follow to manage stressful situations. These adaptive strategies include utilizing proactive measures that aim to change the factors that cause the stressful situation in a given environment or reducing the harmful effects from the factors. On the other hand, maladaptive coping refers to the individuals' tendency to ignore the stressful situation by either denying their need to change the situation although they feel fatigued or disengaging with the stressful situation because they feel helpless or expect unwanted results in case of dealing with the situation (Xiao and Mou, 2019; Lin, et al., 2021). One of the most common behaviors that individuals use to cope with the massive pressure is through selective exposure. Selective exposure refers to the person's selecting the information, medium or content which matches their own set of beliefs, values, or even their current state of mind. Stroud (2018) has argued that selective exposure can occur among individuals for mood management purposes such as anger, stress, and exhaustion. In the virtual world, users are likely to purposely select what content they are exposed to and avoid other content, which can have negative effects on their mood, by using features that social media has offered for its users like restricting, blocking, choosing the people you are following (Malik, et al., 2020). For instance, Instagram has a new feature "not interested" that comes along with any post on the users' feed. In case the user is exposed to some posts that do not match his/her own interests, they would click on this feature to reduce the chances of appearing in their feed again (Instagram, 2020). Similar features are available on other social media platforms such as Facebook, Twitter, Snapchat, YouTube, etc. These features provide SNS users a better experience while using and engaging in the online space as they provide the user with better control and customization of the SNS feed. In the context of social media, this study will explore the relationship between SMF and the coping mechanisms.

2.9 Research design

The design of research is based on finding answers to the following research questions:

RQ1: How do different demographics experience SMF?

RQ2: What are the technological and psychosocial overloads that impact SMF in young adults?

RQ3: What are the coping strategies and usage behaviors that young adults use to cope with SMF?

2.9.1 Measurements

The constructs used in the questionnaire were borrowed from previous studies (see Appendix A) and modified to fit our study's context to assure content validity. As per the validity of the survey, the researchers completed a research brief along with a copy of the questionnaire that were handed to the Research Ethics Committee in the University of Sharjah to test the content validity of the survey. The researchers took the feedback into consideration and completed any necessary modifications that aim to improve the questionnaire's validity, e.g., modification in item wording. To ensure face validity, a pilot study was conducted including 15 young adults through online survey who actively use social media. The participants were encouraged to express their feedback and point out any possible issues they might face and other beneficial suggestions that aim to improve the survey. To test the reliability of the measurements, Cronbach's alpha (Cronbach's α) was run for all the study's constructs. All the constructs scored greater than 0.7 in the Cronbach's alpha reliability test, except for AC3 and MC3 as they were removed because they scored lower than 0.7. Thus, the study measurements were considered reliable as the Cronbach's alpha values are above 0.7 as recommended by Cortina (1993).

2.9.2 Procedure

A convenient nonprobability sample of young adults in UAE were recruited through Survey Monkey. Survey Monkey is an online website with imbedded survey

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software, which helps to generate online survey for both personal and professional use. On the first page of the questionnaire, the participants were given a brief background on the study including the study objectives and the of importance of the study.

To qualify for inclusion in this study, young adults were required to be either males or females, 18 years or older, live in the UAE, and use social media. The front page had this criterion where the qualified respondents were directed to the survey questions. Also, they were informed they could withdraw from completing the questionnaire at any time. Qualified participants completed an online survey administrated using Survey Monkey. The survey was performed from March 21 to April 21, 2021.

2.9.3 Participants

A total of 350 male and female youth aged between 18 and 35 residing in UAE were recruited through convenient sampling. Responses were removed from the analysis in case a large portion of the questions were left without an answer or if a participant's results indicated that they moved through the survey without considering the questions as some of the surveys had unvaried answers, i.e., "strongly agree" or "strongly disagree" was chosen for each question.

3. Findings and data analysis

In the present survey the number of participants is denoted with *N*, mean value with *M*, standard deviation with *SD*; *t* and *p* are used for statistical hypothesis testing and null hypothesis significance testing, respectively. On average, 57 % of the respondents were females while 32 % were males. Most of the participants were aged between 18 and 25 (*SD* = 3.598), while the remaining were aged between 26 and 35 (*SD* = 3.490). Participants who are UAE nationals constituted around 54 % (*N* = 188) of the sample, while other participants defined themselves as "Resident" with 46 % (*N* = 162). A demographic breakdown of the sample is presented in Appendix B.

3.1 Relationship between demographic variables and SMF

The first research question asked if there is an association between the different demographic characteristics of the participants as the independent variable and SMF as the dependent variable. The demographic variables include gender, age and nationality. In order to test the relationship, an independent samples t-test was conducted between the two variables to determine if there is any statistically significant difference between the means in both of the groups. A total of three *t*-tests has been conducted separately on gender, age and nationality along with the dependent variable since SPSS allows to compare only two groups in one setting. According to the results of the *t*-test, there is a significant difference between males (M = 7.50, SD = 3.54) and females (M = 8.34, SD = 3.52)in experiencing SMF, with t(350) = 2.20, p = 0.028. These results suggest that gender is associated with SMF as both males and females may experience social media fatigue differently (see Table 1). According to the results of the *t*-test, there was no significant differences between the first age group from 18 to 25 (M = 8.06, SD = 3.59) and the second age group from 26 to 35 (*M* = 7.87, *SD* = 3.49) in experiencing SMF, with t(350) = 0.49, p = 0.62. These results suggest that age is not associated with SMF as young adults aged from 18 to 35 can equally experience SMF. According to the results of the t-test, there was no significant difference between UAE participants (M = 8.02, SD = 3.40) and non-UAE participants (M = 7.94, SD = 3.72) in experiencing SMF; with t(350) = 0.20, p = 0.83. These results suggest that nationality is not associated with SMF as UAE and non-UAE young adults can equally experience SMF (see Table 1).

3.2 Pearson product-moment correlation coefficient *r* between study measures characteristics and SMF

In Table 2 are presented results of survey conducted in present research, based on N = 350 and significance p (two-tailed) = 0.000. Correlation r is significant at the 0.01 level (two-tailed).

Table 1: Independent samples t-test between demographic variables and SMF

Demographic characteristics and SMF						
		Ν	М	SD	t	p (two-tailed)
Gender	Male	150	7.50	3.540	2.203	0.028
	Female	200	8.34	3.522		
Age group	18-25	204	8.06	3.598	0.491	0.624
	26-35	146	7.87	3.490		
Nationality	UAE	188	8.02	3.400	0.205	0.838
	Resident	162	7.94	3.726		

Study measures	Characteristics	r
Media usage	Daily hours	0.271
	Years of experience	0.456
Technological overloads	Information	0.516
	System	0.416
	Privacy	0.441
	Overall technological overloads	0.546
Psychosocial overloads	Fear of missing out	0.781
	Self-disclosure	0.284
	Social comparison	0.498
	Overall psychosocial overloads	0.741
Social media fatigue	Users' discontinued behavior	0.583
consequences	Switching intention	0.474
related to user	Adaptive coping mechanisms	0.609
	Maladaptive coping mechanisms	0.490
	Overall coping mechanisms	0.603

Table 2: Pearson product-moment correlation coefficient r between study measures characteristics and SMF;for N = 350 and p (two-tailed) = 0.000

3.2.1 Correlation between social media usage characteristics and SMF

A Pearson product-moment correlation coefficient r was calculated to assess the relationship between the number of hours spent on social media on a daily basis, years of experience and SMF. The results show that there is a significant positive correlation between the number of hours spent and SMF, r = 0.271. Moreover, years of experience have also shown a significant positive relationship with SMF, r = 0.456, which means that participants who used social media for a longer period of time have reported experiencing SMF more than those who did not (see Table 2).

3.2.2 Correlation between technological overloads and SMF

A Pearson product-moment correlation coefficient was calculated also to assess the relationship between the overall technological overloads and SMF. There is a significant positive correlation between the two variables, r = 0.546. The same applies for individual characteristics in this group, comprising information overload, system-feature overload and privacy, with similar r values (between 0.416 and 0.516) (see Table 2).

3.2.3 Correlation between psychosocial overloads and SMF

When assessing the relationship between the overall psychosocial overloads and SMF using a Pearson product-moment correlation coefficient, the significant positive correlation is even stronger, r = 0.741. For individual characteristics in this group, the strongest positive correlation with SMF shows fear of missing out, followed by social comparison and then self-disclosure, which shows the weakest correlation with SMF among all characteristics considered in the study (r = 0.284) (see Table 2).

3.2.4 Correlation between the users' discontinued use, switching intention and other coping mechanisms and SMF

A Pearson product-moment correlation coefficient was calculated to assess the relationship between the users' discontinued behaviors and SMF. There is a significant positive correlation between the two variables, r = 0.583. Also, switching intention significantly correlates with SMF, r = 0.474. Furthermore, the results show that there is a significant positive relationship between the coping mechanisms and SMF, with r = 0.603 (see Table 2).

4. Discussion and conclusions

4.1 Key findings

This study examined the SMF phenomenon by highlighting its antecedents in terms of technological and psychosocial overloads, as well as its precedents – discontinued use, switching behavior and other coping mechanisms exerted by young adults in UAE.

The first research question in this study explored the differences in the demographic characteristics, namely gender, age, nationality, number of hours spent on social media, years of experience of the participants with SMF. The results show that gender, number of hours spent on the social media daily and years of expe-

rience are significantly correlated to SMF. According to our study, female participants experience SMF more than their male counterparts. This result is consistent with findings of Vijayakumar and Pfeifer (2020), and Ji, Ha and Sypher (2014), as women are more likely to engage in social media activities than men and participate in online social activities, which lead them to experience social media overload, thus fatigue. Also, this study found that the more years of social media use and the more hours a user spends on social media per day, the more likely the user will experience SMF. Because of using social media over longer periods of time and for many hours a day, this can create a cognitive load and interfere with the individual's day-today tasks and other obligations. However, this result is contradicted by a previous study (Cao and Sun, 2018) given the reason that users may have the autonomy to control their use.

On the other hand, age and nationality are not correlated with SMF, in other words, there were no significant differences found between the two categorial age groups and nationality in experiencing SMF. Young adults can equally experience SMF regardless of their age and nationality. This result is also consistent with the study of Maier, et al. (2015) as it concluded that age is not correlated to SMF.

The second research question examined the role of technological overloads and psychosocial overloads, which impact SMF in young adults. Three technological overloads were assigned in this study: information, system-feature, and privacy concerns. The results show that the information overload positively correlates with SMF. This finding is in agreement with previous studies (Nawaz, et al., 2018; Fu, et al., 2020) as social media users are flooded with the huge amount of news and information they receive via social networking sites and mobile applications, which exceeds their processing capacities, resulting in feelings of fatigue and exhaustion. Likewise, system-feature overload positively correlates with SMF. Associated with a previous study by Fu, et al. (2020), system-feature overload can leave a user feeling pressured and exhausted because of the endless, continuous technical updates required by social media applications. Moreover, the privacy factor is positively correlated with SMF. In line with previous studies (Salo, Pirkkalainen and Koskelainen, 2017; Lim and Choi, 2017; Bright, Lim and Logan, 2021), privacy has been emphasized as one of the most important factors to look at when exploring the fatigue phenomenon among social networking users. The online users' privacy concerns are often related with their perception of losing their own autonomy and control over securing their personal information, contact details, location, etc., which leads to less engagement on these social media applications (Bright, Lim and Logan,

2021). Some of the leading social networking companies like Facebook, which now owns Instagram and WhatsApp, has become the focus of attention and concern of millions of users around the world about the alleged reports of the company's misuse of its users' personal data, ultimately leaving users question the safety of these social networking apps (Jozani, et al., 2020; Chung, et al., 2021). As for the psychosocial overloads, three factors were assigned in this study: fear of missing out, self-disclosure, and social comparison. Fear of missing out has a significant correlation with SMF. In alignment with recent studies (Malik, et al., 2020; Tandon, et al., 2021), this result implies that users who experience SMF are more likely to stay connected to social media for most of their time because of fear of missing out on some rewarding experiences that their friends might have, social events, news, information, and other fun online activities. In addition, they might exhibit feelings of social comparison with others who usually share their progress and other personal accomplishments online. Similarly, self-disclosure has also a positive association with SMF. Along with previous studies (Dhir, et al., 2019; Malik, et al., 2020), this finding can be linked with the users' desire to reflect their own self-image with their success in life and other accomplishments resulting in revealing some sensitive personal information in their page, direct messages or even virtual groups, which ultimately leaves the users feeling extremely fatigued (Dhir, et al., 2019). Also, this can be explained by the fact that users who engage in self-disclosure behaviors are more likely to feel fatigued since many online connections and peers may interact with the users' posts, etc. Eventually, the users will feel fatigued from the great amount of messages and notifications they receive (Kaur, et al., 2021). Social comparison is also positively associated with SMF. Previous studies (Malik, et al., 2020; Kaur, et al., 2021; Tandon, et al., 2021) confirmed that individuals do compare themselves to other online users who they perceive as superior or more successful in life which triggers negative emotions and feeling of unworthiness. Furthermore, users who participate actively on social media by sharing parts of their "glamourized" lives usually select only the good parts to show. As a result, this may induce feelings of jealousy, emotional instability, dissatisfaction, and unworthiness. Consequently, the users' who compare themselves to others will most likely harm their psychological well-being and cause fatigue (Maier, et al., 2015).

The third research question explored the behavioral implications that may occur as a result of SMF such as discontinued use, switching intention and other coping mechanisms. Discontinued use has a positive correlation with social media fatigue. In line with previous studies (Cao and Sun, 2018; Fu, et al., 2020), feelings of exhaustion and weariness from social media can result in the users' behavior of discontinuing the use of these platforms in the form of a short break, or long periods of time. Likewise, switching behavior is positively correlated with SMF. The result is in agreement with previous studies (Hou and Shiau, 2019; Zhang, Ding and Ma, 2020) as switching behavior is another effective mechanism that online users adopt when they feel overloaded, exhausted, dissatisfied, or even unmotivated to use certain online platforms. Online users who tend to migrate to other platforms usually experience either social pressures to do so or are exposed to some technical difficulties of using the platform like the platform's system-features. As for the other coping strategies, the results show that users adopt two types of coping mechanisms: adaptive and maladaptive mechanisms. This result is confirmed by previous studies (Xiao, and Mou, 2019; Lin, et al., 2021) as users can selectively choose the social media they want to use, the people, celebrities, influencers they would like to follow, and block, ignore or restrict other unwanted individuals, which creates a type of personal autonomy over their personal use of social media as a part of their adaptive coping. Additionally, online users may practice maladaptive coping when they feel helpless to change the stress and fatigue they feel when using social media like denying the existence of the overload, neglecting, and disengaging with the platform's content, individuals using the platform, or the platform itself (Lin, et al., 2021).

4.2 Conclusions

Our study presents an overview on the SMF phenomenon among young adults whose psychological well-being is affected by the overloads and the continuous pressures that have existed in social media platforms especially in these uncertain times of COVID-19 which exposed millions around the world to feel insecure and pressured. Social media has been a main communication medium through this pandemic that supplied individuals with news, information, and entertainment during the lockdown period. For this purpose, the study explored the relationship between technological (information, system-feature, and privacy concerns) and the psychosocial (fear of missing out, self-disclosure, social comparison) antecedents of SMF among young adults in UAE. Furthermore, the study examined the usage behaviors (discontinued use, switching behavior) that occur as a result of the exhaustion and the other coping mechanisms (adaptive and maladaptive) in which the young adults use to control their feelings of fatigue, exhaustion and weariness from the intensive social media use. Also, the study highlighted the differences among demographic characteristics (gender, age, nationality, number of hours spent on social media daily, years of experience) in experiencing SMF. The findings of this study show that the two types of overloads are significantly positively correlated with SMF. Technological overloads impact the users' ability to use and interact with the platforms as a result of the abundance of unrelated, false and repetitive information found in many pages, the developers' continuous change of the platforms' features and interface, along with some privacy concerns regarding preserving the users' personal information and the misuse of these information for commercial reasons. While psychosocial overloads impact the users' ability to use the platform as a result of connecting to social media most of the times, engaging heavily in the social platform by expressing opinions, attitudes, and emotions as a self-expression, keeping up with family members and friends by liking and commenting, and comparing oneself to others online. Also, the study identifies two usage behaviors (discontinued use, switching behavior) that users may adopt when they feel exhausted with the use of social media. Users may adopt discontinued behavior, which includes the termination of using the platform for either short or long periods of time. This can take place in extreme situations when the user will usually feel dissatisfied and fatigued from the usage of a platform. Users may also try switching the platform to another convenient platform that does not cause pressure to the users. Lastly, the study discusses two types of other coping mechanisms (adaptive and maladaptive) that does not require either the abandonment of the platform or migration from one platform to another. The adaptive mechanisms the young adults incorporate to deal with the exhaustion include proactive measures and building healthy habits of social media usage like tracking the usage time, choosing the people and the pages in which they would like to connect with. The maladaptive mechanisms can be described as a more negative approach of dealing with the fatigue as it usually takes place unconsciously where young adults still do use social media although they feel fatigued and overloaded.

4.2.1 Theoretical implications

The study's findings offer several important theoretical implications to the existing literature. First, unlike prior studies, which have concentrated on the positive implications of social media, this study aims to serve a balanced perspective of the social media's dark side by exploring the relationship between the SMF phenomenon and its antecedents (technological and psychosocial overloads), as well as the relationship between SMF and its consequences (behavioral implications and coping mechanisms). Moreover, this is the first study of its kind to be conducted on the SMF phenomenon in the Arab literature and most specifically in the UAE setting. Second, this study offers a novel contribution to the field of cyberpsychology and technostress by showing how the two types of overloads are significantly associated with SMF. Such association illustrates

how different overloads can affect the online users' psychological well-being and their social media use. Third, the study was conducted during the COVID-19 pandemic and thus it may present rich insights into the young adults' use of social media in emergency times, which can have major effects on their use of social media as a main tool for communication. Lastly, unlike previous studies, which focused on discontinued behavior as a consequence of SMF, our study presents an additional, new behavioral implication which is the switching behavior along with the discontinued use. Switching behavior has not been widely explored in the context of SMF as a consequence. In addition, our research presents the other coping mechanisms (adaptive and maladaptive) that have been scarcely discussed in the light of SMF phenomenon. This is the first study to explore the coping mechanisms from a communication perspective drawing on the selective exposure and selective avoidance theory.

4.2.2 Practical implications

Our study offers several practical implications for social media users, social media providers and developers to take into consideration. As for the social media users, they must understand the impact of the extensive, uncontrollable use of social media on their psychological well-being. Therefore, we recommend social media users, especially young adults, to monitor their social media usage and adopt healthy habits of usage in order to avoid exhaustion, cognitive load, and depletion of energy levels, in particular in uncertain situations like pandemics and lockdown. Furthermore, we advise young adults to take proactive, adaptive measures when using social media like seeking help from professionals and close people, selecting the pages that report official news and factful information and avoiding unofficial news pages, as well as filtering out any other type of content or individuals that may disturb their sense of well-being. In extreme situations, we additionally advise young adults to reduce their usage of the platforms or take a short break from using social media until they recover from the harmful impacts of the social media overloads. For social media developers and providers, our results indicate the drivers of SMF, the behavior usage, and mechanisms in which the young adults follow to lessen their dissatisfaction and exhaustion from social media. To avoid the users' termination, long discontinued use, or even migration from the platform to another one, social media developers must develop new features that work through artificial intelligence to set alerts next to any misleading information or news. Furthermore, developers must take strong precautions to protect the users' identities and personal information and let the online users know of any changes that may occur to their privacy policy and terms of use. Moreover, web developers must take into consideration the opinions and ratings of the platform's users in order to enhance the users' experience.

4.2.3 Limitations and future research

First, the findings of the study cannot be generalized since the targeted population were young adults in the UAE. Future research should explore these correlations among other demographic categories such as middle-aged workers, housewives, cultural background, online users in the Arab countries, users of mobile instant messaging applications like WhatsApp and Telegram instead of social media. Second, the study took place during a critical time of COVID-19 pandemic, which made communication difficult with the respondents. Third, this study is based on a cross-sectional data collection. Future scholars may consider conducting a longitudinal study to observe differences or causalities between the studied variables. Fourth, future scholars are encouraged to use related yet unusual study constructs such as personality traits, sleeping difficulties, emotional well-being, etc. Lastly, future work should focus on conducting studies using different methodologies, such as focus groups, interviews, etc. Qualitative methods offer a deep insight on the studied phenomenon, which can generate more understanding and show different viewpoints that quantitative methods are not able to tackle upon.

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Appendix A: Driving force rank

Study measures	Measurement item	Source	Cronbach alpha
Social media fatigue (SMF)	SMF1 – Generally, I feel that I have lost interest when using social media SMF2 - Generally, I feel drained when using social media SMF3 – Generally, I feel more stressed and pressured when using social media during the COVID-19 pandemic	Xiao and Mou, 2019	0.837
Information overload (IO)	 IO1 – I feel overwhelmed with the excessive amount of news and information that I can process daily on social media IO2 – I feel that a huge part of the information available on social media does not match my interests IO3 – I feel that I cannot tell the difference between important and unimportant information available on social media 	Zhang, et al., 2016; Cao and Sun, 2018	0.842
System-feature overload (SO)	SO1 – I feel that there are a lot of technical updates in social media SO2 – I feel difficultly using social media due to the continuous updates SO3 – I feel that I need some time to adjust to the new updates in social media	Zhang, et al., 2016	0.717
Privacy concerns (PC)	PC1 – I feel worried about my privacy in social media PC2 – I feel worried that someone will have access to my private information or follow my activity on social media PC3 – I feel worried that the information I submit to social media could be misused	Dinev and Hart, 2006	0.779
Fear of missing out (FOMO)	FOMO1 – I feel that I want to stay connected to social media FOMO2 – I feel anxious when I know of an important event or information too late FOMO3 – I make sure to use any new social media because of the fear of missing out	Przybylski, et al., 2013	0.968
Self-disclosure (SD)	SD1 – I make sure to share private information about myself like my interests, achievements, opinions, and some personal photos on social media SD2 – I express my personal feelings and emotions on social media SD3 – I feel that the information I share on social media reveals a lot about myself	Posey, et al., 2010	0.856
Social comparison (SC)	SC1 – When I am on social media, I tend to compare myself with others SC2 – When I am on social media, I often compare my own accomplishments with others SC3 – When I am on social media, I compare my situation in life with that of others	Gibbons and Buunk, 1999	0.708

Study measures	Measurement item	Source	Cronbach alpha
Discontinued behavior (DB)	DB1 – Sometimes, I take a short break from social media DB2 – I have completely stopped using one or more social media DB3 – I stopped using one social media and started using another one	Maier, et al., 2015	0.811
Switching intention (SI)	 SI1 – I am considering switching from one social media to another SI2 – The chance of my switching to another social media is high SI3 – I am determined to switch to another social media 	Chang, Liu and Chen, 2013	0.734
Adaptive coping mechanisms (AC)	AC1 – I focus my efforts on doing something towards the pressure I feel on social media like tracking my usage time and choosing the people and pages I'd like to follow AC2 – I focus my efforts on doing something towards the pressure I feel on social media like ignoring unwanted people and pages, and block them if necessary AC3 – I have been getting help and instrumental support from other people regarding dealing with stressful situation on social media	Gaudioso, Turel and Galimberti, 2017	0.817
Maladaptive coping mechanisms (MC)	 MC1 – I use social media even when I feel pressured and exhausted MC2 – I don't feel like I need to change my usage habits of social media even though I feel pressured and exhausted MC3 – I have been refusing to believe that mess has happened on social media 		0.750

Demographic characteristics and SMF		N	Percentage (%)
Gender	Gender Male		42.9
	Female	200	57.1
	Total	350	100.0
Age group	18–25	204	58.3
	26-35	146	41.7
	Total	350	100.0
Nationality	UAE	188	53.7
	Resident	162	46.3
	Total	350	100.0
Number of hours	Less than 1 hour	1	0.3
	1–2 hours	32	9.1
	3–5 hours	100	28.6
	More than 5 hours	217	62.0
	Total	350	100.0
Years of experience	1–2 years	13	3.7
-	3–5 years	79	22.6
	6–8 years	123	35.1
	More than 8 years	135	38.6
	Total	350	100.0

Appendix B: Demographic characteristics frequencies

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The implementation of a new pop cosmopolitanism concept in the process of mediatization of Japanese mass culture

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Abstract

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This academic work deals with a concept of a new pop cosmopolitanism presented by Henry Jenkins and scrutinizes the ways it implements in the process of mediatization of Japanese mass culture. The paper highlights a local and comprehensive pop cosmopolitanism as characteristics of recipients of Japanese mass culture, e.g. anime, manga and games. Mediatization of Japanese mass culture provides a cultural convergence, when people perceive parts of foreign culture as their own, and become the cosmopolites. In addition, other countries start using the elements of Japanese mass culture to fulfill the needs of its own and the Western audiences, for instance Chinese game company develops a game in Japanese anime style to sell it to the West. We analyze the spreading of Japanese mass culture in two directions: channels of spreading and techniques of games, online anime-styled characters, e.g. vocaloids and virtual youtubers, anime and manga franchises and anime streaming services. This piece of work aims to show how mediatization makes Japanese language a brand in terms of cosmopolitanism and cultural exchange. The paper is of current importance due to a broad spread of diverse elements of Japanese mass culture around the world and steady rise of its popularity within people of all nationalities. The results of the research can be useful for further explorations of Japanese and international media discourse.

Keywords: local cosmopolitanism, comprehensive cosmopolitanism, globalization of Japanese pop culture, anime and manga franchises, virtual anime-styled characters

1. Introduction

1.1 Background

According to Stanford Encyclopedia of Philosophy, cosmopolitanism (from Greek kosmopolitēs – 'citizen of the world'), in a wide sense, is a variety of important views in ethic and socio-political philosophy that describe the idea that human beings, regardless of their political affiliation, are citizens of a single community (Kleingeld and Brown, 2019). As a core approach, the authors used that of Henry Jenkins who introduced two terms describing the results of global mediatization and intercultural interaction: a pop cosmopolitanism and a new pop cosmopolitanism (Jenkins, 2004a, p. 117). The scholar explains the necessity of such division by the actualization of global convergence, which allows a cosmopolite to widen a sphere of cultural experience and not only to go beyond one's own cultural background but also to think globally, to consume an international product both at the level of high culture and e.g. in everyday life, in mass culture. Jenkins (2004a, p. 117) uses the term 'pop cosmopolitanism' to define the ways "that the transcultural flows of popular culture inspire new forms of global consciousness and cultural competency", emphasizing that "younger Americans are distinguishing themselves from their parents' culture through their consumption of Japanese anime and manga, Bollywood films and bhangra, and Hong Kong action movies". It should be pointed out that Jenkins states that pop cosmopolitanism equals neither technological utopism of 'global village' by Marshal McLuhan (1964 cited in Jenkins, 2004a) nor ideological fears of media imperialism. 'New pop cosmopolitanism', except for Jenkins, is also considered by Constance Steinkuehler (2006) referring to the work by James Paul Gee as "a discourse, or 'way of being in the world', marked by a willingness and ability to navigate an increasingly globalized, diverse, networked, socio-technical world" (Gee, 1999). Confirming this viewpoint by examples, Jenkins tells how he met an American girl with a Japanese name who was a fan of anime culture. He uses this image to define the term pop cosmopolitanism: "She is what this essay calls a pop cosmopolitan, someone whose embrace of global popular media represents an escape route out of the parochialism of her local community" (Jenkins, 2004a, p. 152). The scholar states that with the development of new technologies, a new epoch of media communications comes, and together with it, a new pop cosmopolitanism appears. As an example, the researcher described the combination of western and Asian cultures: "A new pop cosmopolitanism is being promoted by corporate interests both in Asia and in the West" (Jenkins, 2004b, p. 41). Jenkins believed that cultures of different countries mix with each other the way that people begin to take the elements of a foreign culture as a part of their own because these elements surround them since childhood and thus, become ordinary for people. A famous character of video games Super Mario is referred to as an example. American children know him and consider as a part of their native culture because they have played the games about him since childhood. However, Mario, according to the plot, is an Italian; the game about him is designed by a Japanese company Nintendo. Thereby, a cultural convergence happens, which Jenkins (2004b) describes as a new pop cosmopolitanism that creates common cultural space for people sharing interests (e.g. anime) from different cultures.

Apart from Jenkins in the West, eastern scholars also explored concepts resemblant to the new pop cosmopolitanism. Thus, Iwabuchi (2002) presented the theorization on the dissemination and globalization of Japanese popular culture and studied the concept of mukokuseki, which means nationless or stateless, or describes a person or a phenomena that does not belong to any country or nation as well as does not have any membership anywhere: it is 'a country-neutral quality' (Iwabuchi, 2002, p. 78). Iwabuchi believes that "... the international spread of mukokuseki popular culture from Japan simultaneously articulates the universal appeal of Japanese cultural products and the disappearance of any perceptible 'Japaneseness'" (Iwabuchi, 2002, p. 33). Such a feature of Japanese anime, manga and games helps to understand the new

'global consciousness', and prooves that nowadays Japanese pop culture becomes more and more cosmopolitan, and there is no wonder that non-Japanese audience such as American kids described by Jenkins, could easily misinterpret its cultural origin. This way, the further exploration of the concept of mukokuseki is very useful in understanding transcultural reception at the local level. On this occasion, the cultural origin of a certain piece of mass culture, such as Mario game, becomes unimportant for the recepients: they are Americans and they consume a foreign pop culture as American, despite it is not American. On the contrary, Jenkin's new pop cosmopolitanism concept is more useful in understanding the dissemination of international media at the global level. Jenkins describes a global pop cosmopolite as an American girl he met in the grocery store during his trip. "The grocery clerk, a white girl with a broad southern accent, was trying to explain why she had a Japanese name on her employee badge and found herself talking about an alternative identity she assumes through 'cosplay', the practice of anime fans dressing up like their favorite characters" (Jenkins, 2004a, p. 152). Unlike those kids who did not consume the Mario game as a Japanese one (which made it mukokuseki at the local level of cultural reception), this girl fully understands that the pop culture she consumes belongs to Japan, and she likes it. Thus, at her local level she receives the foreign culture as a global piece of information. In that case, her nationality becomes unimportant: she is an American, but it does not matter for her. She uses a Japanese name and likes Japanese anime and manga and thus she is the part of the global community and the anime fandom. The nationality of the information unit recipients there becomes unimportant because they are united by a common culture that is a mixture of different cultures, languages, literatures, fictions, characters and media content. While at the local level these processes might be taken as just misinterpretation of the exact culture the character or work belongs to, in global terms it is a complicated interaction between media cultures of different countries, creation of branched franchises that sell media content not only inside the country but also beyond its boundaries, as well as not only inside the countries but also inside cultural communities of people with general interest where a nationality does not matter. Only their preferences matter.

1.2 Theoretical framework

Jinni Pradhan (2010) offers to divide the term pop cosmopolitanism into two types: local pop cosmopolitanism and comprehensive pop cosmopolitanism. The first type represents a local cosmopolite – a person "... who explores a foreign culture while still rooted in their local, everyday culture of which their interest in global popular culture is a part" (Pradhan, 2010, p. 86). A local cosmopolite "... always has one foot in their local culture and one foot in the foreign culture, consuming the foreign culture through the frame of foreign popular culture which has been absorbed into their local culture and identity" (Pradhan, 2010, p. 86). The second type represents a comprehensive cosmopolitan - a person completely absorbed into a foreign culture and "... willingly letting go of their connections to their local culture to achieve this" (Pradhan, 2010, p. 86). Pradhan stresses that "Comprehensive pop cosmopolitans can happily live with both feet in a foreign culture, but they know that they have the ability to go back to their local culture at any time - they maintain a full perspective of both the local and the foreign cultures that compose their identity" (Pradhan, 2010, p. 86). Hence, a local pop cosmopolitanism is the first stage that can lead to the second - a more deepened into a foreign culture stage of comprehensive pop cosmopolitanism, if a person wants to accept a foreign culture from inside not only through one's own culture. In a mediatized global society, the consumption of Japanese mass culture starts with manga as a product of mass culture, which successfully functions poly-format space (anime, video games, franchises, merchandizing, etc.). Pradhan (2010) states that manga became pop cosmopolitan by approbation and localization of Japanese anime series by American TV. Anime boom in the USA started at the end of the 1990s. In September 1998 anime Pokemon was shown on American TV, in 2001 - Yu-Gi-Oh. Anime, dubbed in English, was broadcast in the afternoon (after school ends) and on Saturday mornings. Approximately at this period, anime appears in Europe with the translation into national languages. For example, on Ukrainian TV anime series Cardcaptor Sakura was broadcast on New Channel from 2 June till 1 November 2002, and from 29 April till 7 August 2003. Also, New Channel showed anime Digimon Adventure and Pokemon. According to Shikimori (2021) website, for the last 18 years in Ukraine anime was broadcast by New Channel, Tonis, QTV, Malyatko TV, 1+1, 2+2, NLO TV, UA:Pershy, TET, K1, ICTV. A single generation grew up taking anime as a harmonious part of national Ukrainian TV-content. In this process, anime audience almost do not think of Japan as a country of production. The stage of plunging into a foreign culture begins with the consumption of mediawork in the original language with the use of translation in the form of subtitles. Pradhan (2010) emphasizes that nowadays Japanese media content on YouTube, including that connected with anime and idols, has subtitles in different languages that are added by ordinary users from various countries. Thus, it is possible that a foreigner translates a certain video from Japanese into English and/or one's native language. "It is important to think about not only how native audiences are consuming their media, but how culturally non-native audiences are consuming these globalizing media texts", - stated Pradhan (2010, p. 9).

Iwabuchi (1999) in his work 'Returning to Asia: Japan in the cultural dynamics of globalisation, localisation and Asianisation' analyzed the concept of 'a Japanese transnational cultural power'. It describes the global spread of Japanese audiovisual cultural forms on global markets. Thus, it illustrates the current globalization of Japanese anime, manga and games throughout the world as the manifestation of the new pop cosmopolitanism examples we studied further in this paper.

Appadurai (2010) in his work 'Modernity at Large' believes that media globalization creates affective relationships between different people from different countries and with different jobs, and forms a cultural flow of 'mediascape'. It could be used as a representation of how Japanese pop culture unites people who share the same interests throughout the world.

All the processes mentioned are influenced by the phenomenon of mediatization that, on the one hand, is a peculiar scientific trend, but on the other hand, remains rather disputable in a world scientific discourse. The world science has been studying the phenomenon of mass culture mediatization since the middle of the 20th century. Different levels and aspects of mediatization (mediation, medialization, mediatization) have become the centre of scientific interest for the following scholars: Harold Innis, Marshal McLuhan, Norm Freisen, Theo Hug, Lynn Schofield Clark, Nicklas Luhmann, etc. Nick Couldry and Andreas Hepp trace the development of the concept since 1933 when Ernst Manheim published his own thesis 'The Bearers of Public Opinion' where he comprehended "mediatization of direct human relationships" (Manheim, 1933 cited in Couldry and Hepp, 2013, p. 195), and base on the research results of Jean Baudrillard (1976 cited in Couldry and Hepp, 2013), Jurgen Habermas (1984 cited in Couldry and Hepp, 2013), Ulf Hannerz (1990 cited in Couldry and Hepp, 2013). Proceeding with the analysis of a scientific discussion around the phenomenon, it is impossible not to mention Winfried Schulz (2004) who connected mediatization with three main communicative functions of media: retransmission, semiotic and economic functions, and singled out the processes of social transformations where media have a key role. According to Schulz (2004), they include extension, substitution, amalgamation and accommodation. First, media technologies blur a traditional understanding of space-time boundaries, often destroying them. They also help overcome the barriers of information encoding. Consequently, they broaden humanity's communicative possibilities actualizing, as Schulz (2004) stated, McLuhan's statement that media are "the extensions of man" (McLuhan cited in Schulz, 2004, p. 88). Second, media either partially or completely substitute certain types of people's activity. At the same time, "in the process of mediatization not only non-media activities have assumed media form, but also new media have substituted traditional forms of communication". This process can also be traced in social and cultural phenomena (video sermon, digital diplomacy, online education, virtual art, e-commerce, etc.), as well as in media environment (immersive technologies VR and AR, convergent, cross-media practices, trans-media story-telling, etc.). As for the merger, the process of media and non-media technologies unification, interpenetration of various types of people's activity and their interconnection with communicative environment, according to Schulz (2004), lead to "the media's definition of reality amalgamates with the social definition of reality". Finally, "the mere fact that communication media exist induces social change ... the various economic actors have to accommodate to the way the media operate" (Schulz, 2004, pp. 89-90).

Knut Lundby (2014) in his grounded work 'Mediatization of Communication' differentiates:

- a notion of cultural mediation, referring to Jesús Martín-Barbero's work (Martín-Barbero, 2006),
- a socio-constructivist approach of Nick Couldry and Andreas Hepp (2013; 2016) as "one of the two main traditions of scientific study of mediatization" (Lundby, 2014, p. 10);
- institutionalist tradition of Stig Hjarvard (Hjarvard and Petersen, 2013; Hjarvard, 2014), who considers mediatization as a social process;
- his own materialist approach, which is based on the technological factor of mediatization (Lundby, 2014).

Obviously, scientists interpret chronological borders of the concept 'mediatization' in different ways. Andreas Hepp, Stig Hjarvard and Knut Lundby (Hepp, Hjarvard and Lundby, 2015), as well as Peter Lunt and Sonia Livingstone (Lunt and Livingstone, 2016) criticize David Deacon and James Stanyer's views (Deacon and Stanyer, 2014; 2015) as for including 'mediatization' in the phenomena of 'modern times'. Basing upon the works of Friedrich Krotz (2001; 2009), they consider mediatization as an old basic meta-process that is closely connected with civilizational development. Knut Lundby (2015) gives a generalized characteristics of mediatization, which we accepted as a basis in this article: "Mediatization research is not about media effects but, as noted above, about the interrelation between the change of media and communication, on the one hand, and the change of (fields of) culture and society, on the other hand." (Lundby, 2015, p. 320).

While researching mediatization of mass culture, we were guided by the work of Johan Fornäs (2014), which, first of all, contains a clear definition of mediation - "mediation is when something functions as a linking device between different entities, for instance between human subjects or between social worlds across a distance in space or time", media as "socially organized technologies made for use in such mediating communication practices", and mediatization through understanding it as "a historical process whereby communication media become in some respect more 'important' in expanding areas of life and society, as media technologies, texts, and/or institutions are experienced to become involved and influential in increasingly many spheres and contexts" (Fornäs, 2014, p. 484). In addition, Fornäs connects mediatization with culture by understanding its specific regime that concerns institutional technologies of culture, but not its other aspects (e.g. sense). Finally, in our opinion, the research has a useful understanding of 'mass culture', which defines it "not as any fixed and logically bounded essence or set of works and genres, but rather as a dynamic sociocultural construct" (Fornäs, 2014, pp. 489–490). Fornäs performs an analysis of mass culture on different forms of its realization: graphic, printed, audio-visual and digital, which allows us to make assumptions as for the expediency to analyze Japanese manga and anime as a mass cult phenomenon, using this approach and the works of Lukas R. A. Wilde (2019), Robert Fraser (2018), Marc Steinberg (2012), Dean Chan (2008), Sharon Kinsella (1999), etc.

2. Research methodology and conceptual framework

The article defines the specificity of Japanese pop-culture products representation in media environment (manga, anime), their globalization and realization on the level of pop cosmopolitanism conception. We consider anime and manga as Japanese pop-culture products, basing on Fornäs's theory. The research regards mass culture and pop culture as equivalent. The term 'pop cosmopolitanism' is interpreted based on Henry Jenkins's understanding (Jenkins, 2004a), and its introduction to a Japanese media model is based on Jinni Pradhan's publication (Pradhan, 2010). The concept of nationless Japanese pop culture (mukokuseki) is taken from Koichi Iwabuchi's work (Iwabuchi, 2002), as well as the analysis of soft-power theory in application to Japanese pop culture (Iwabuchi, 2015) and from William Spencer Armour (2011). As a core factor, we chose the process of mass culture mediatization according to Fornäs (2014). In this paper we, according to Jenkins (2004a), situate the concept of new pop cosmopolitanism on participatory culture and media convergence in a global context. We also situate the new pop cosmopolitanism in transcultural and postcolonial media

communication studies according to Koichi Iwabuchi (1999; 2002; 2015). In this research we consider the terms 'mass culture' and 'pop culture' as equivalent, and by that we mean manga, anime, games, their franchises, which are an empiric material of our work.

This paper aims to show how the new tendencies in the field of mass culture mediatization are implemented on the global level. It also touches upon the following research questions (RQ):

RQ1. Is it important to consider what country produces a mass culture product on the global level?

RQ2. What role do Japanese national markers serve in a process of a global mass media product spread?

RQ3. How does Japanese mass culture enter a global level and is there a scheme of its interaction with domestic and global audiences?

RQ4. What technics of mass media spreading can be considered effective?

In this work, we used the following methodological research framework to make our contribution:

- Described a theoretical background of the research by juxtaposing the theories of the new pop cosmopolitanism and mediatization.
- Applied the systematic analysis to create a schematic representation of a typical Japanese mass culture franchise as a starting point of our research.
- Chose 13 franchises by the purposive sampling method, which, in the authors' opinion, are the examples of the new pop cosmopolitanism concept realization. These 13 franchises include Fate, Kantai Collection, Azur Lane, Mahjong Soul, Nier, Genshin Impact, Love Live!, Uzaki-chan wa Asobitai, Sword Art Online, Tower of God, Re:Zero, Devilman and Baki. Such franchises are suitable for analysis because they are up-to-date cross-media platforms, popular all over the world. Some of them originated from Japan, some are from China, and others are cooperation between different countries, e.g. Japan, South Korea and the USA. However, all of them have something in common: they all exploit a concept of a Japanese pop culture to attract their audiences.
- Distinguished five segments which include the most important representations of mass culture and the new pop cosmopolitanism in Japan and abroad: game trend (gacha games, visual novels), online anime-styled characters (vocaloids, virtual

youtubers), manga and anime franchises, anime streaming services (Crunchyroll, Funimation, Netflix), transcultural anime fandom (fan labour and works: fansubbing, doujinshi, cosplay).

- Within each segment, defined the most popular and important pieces which reflect the current tendencies within their group.
- Analyzed each piece within its segment to schematize the following aspects of its functioning: development of franchises on domestic markets, structural aspects of Japanese mass culture (e.g. analysis of particular pieces of pop culture, such as anime), technical aspects of globalization (e.g. by which means they enter a global level, such as streaming services), new media tendencies and what makes these franchises pop-cosmopolitan. The analysis of mass culture products is performed on the following levels: channels of spreading and technics of entering a global level.
- Created new figures and schemes to summarize our findings and new information.
- Discussed how Japanese language becomes a brand in terms of mass media products and the new pop cosmopolitanism.

3. Results

3.1 Structure of anime franchise

No doubt, a modern Japanese media system is not limited by traditional analog media. On the contrary, press, radio and TV are combined into complicated cross-media systems involving online technologies, Internet-platforms and even elements of augmented reality. Besides, the role of media representing mass culture has greatly increased: anime closely connected with TV, manga that is a part of printed media, games and mobile applications market, which broaden the franchise of different mass media and integrate it into a cross-media system. A modern mass culture consumer is surrounded by the content due to one's favorite media through a great number of communication channels. Here we focus on the structure of a typical popular anime franchise, its channels of spreading and the technics to enter a global level. We distinguish four possible types of franchise development (see Figure 1). Left column represents a chain 'animemanga-visual novels \ mobile games \ video gamesmerchandise' which depicts a subsequence of the appearance of certain media on the market. In other words, a studio creates an anime, then it is turned into manga comics, after that - into visual novels or games, or even both, and finally franchise owner makes different merchandise with characters of one's series: plastic figures, goods, clothes, etc. Respectively, the following columns represent similar processes, but in the different order: franchise could start from manga, game or any other original project, even a music CD. As a particular example of franchise development, we take a popular franchise Fate created by a Japanese author Kinoko Nasu, and represent its subsequent genesis. It is originated from visual novel Fate / Stay Night by a Japanese company Type-Moon in 2004. Next, an anime adaptation of the novel happens with a further broadcasting on TV channels Chiba TV, AT-X, TV Aichi, Tokyo Metropolitan Television, Sun Television, Kyoto Broadcasting System, TV Saitama and TV Kanagawa. Later, the anime was released on eight DVDs and rereleased in Blu-ray format. After that, based on the

novel, manga Fate / Stay Night was published in magazines Shonen Ace and Young Ace in Kadokawa Shoten publishing house in 2006. Then, a great number of anime with the franchise Fate appeared in the period 2006-2020. The most significant ones were Fate / Zero (prequel), Fate / Stay Night Unlimited Blade Works (remake), Fate / Kaleid Liner Prisma Illya (spin-off), Fate / Apocrypha (spin-off), Fate / Extra (spin-off), Fate / Stay Night Heaven's Feel (alternative story), Carnival Phantasm (parody that unites the characters of various author's works into a single media space) and Fate Grand Order (spin-off). The majority of spinoffs also got manga-version. Later, a film was on at the cinemas that was an adaptation of another plot part Unlimited Blade Works from the studio Deen in 2010. After that, a mobile game spin-off Fate Grand Order from Aniplex anime and music production company



Figure 1: Typical variants of the development of Japanese pop-culture franchise

appeared in 2015. It was significant because it united the characters of all the parts of the franchise into one game and became a vivid example of trans-media narration. In 2016 a Chinese version appeared, and in 2017 versions for the USA, Canada, Singapore, Hong Kong and South Korea. In 2018 the improved version for Japanese arcade machines appeared. The game is free-to-play, but optionally, it is possible to spend real money on it. In 2017 Fate / Grand Order earned 982 million US dollars, in 2018 1.2 billion, in March 2019 3 billion, and at the beginning of 2020 a total profit of the game exceeded 4 billion US dollars. An American version Fate Grand Order has its own radio that tells about game events, news, stories, etc. The game has more than 8 million gamers in the USA. There is a limited access to the game for other countries apart from Canada and Singapore. Japanese and Chinese versions are also limited for their countries, which does not prevent them from making huge profits. Fate / Stay Night Heaven's Feel in the format of three full-length anime films was shown not only in Japan and the USA cinemas. Spin-off Emiya-san Chi no Kyou no Gohan is available in Original Net Animation (ONA) format that is spread through the Internet. Thus, franchise Fate is represented in different media formats and is broadcast through all media channels.

3.2 Anime formats according to the channel of spreading

- TV anime series that is broadcast on Japanese channels. An episode lasts on average 24 minutes and is divided into two blocs, each of 12 minutes, with commercials between them. Advertising is also shown at the beginning and at the end of an episode on special insertions.
- Web the same TV-anime but it is broadcast through paid streaming services on the Internet both in Japan and beyond the country. No advertising.
- BD/DVD TV-anime, but it is released on disks after the TV broadcast completes. It is of high quality, often with additional or improved scenes. In erotic or violent anime, in this case, there is no censorship. Rather expensive (up to 40 000 yens for a set), no advertising. DVD costs cheaper and has a maximal quality 480p, BD 1080p.
- OVA (Original Video Animation) anime format that is released only on disks. The OVA-anime is not broadcast on TV. Also a so-called special is marked this way. It is an additional, e.g. 13th episode in a 12-series TV-anime, that is released as a bonus only on disks and only for those who bought BD/DVD-version.

- OAD (Original Animation DVD) anime format that has an additional exlusive episode released only on DVD and in a set with manga Tankōbon, available for those who bought a certain volume of manga with it.
- ONA anime format released only through streaming services on the Internet. No broadcast on TV.
- Movie a full-length anime film. It is on at the cinemas and later, on disks.

3.3 Variants of different franchises as the examples of the new pop cosmopolitanism

3.3.1 Game trend

Gacha games are a Japanese game genre based on a principle of a slot machine where a gamer tries to get a virtual prize. Kantai Collection is a Japanese gacha game for browsers. In its case, one 'builds' ships in the form of girls. The more unique they are, the fewer chances are to get them. This game was released in 2013 and was available only in Japan. In 2015 it got an anime adaptation. The game became one of the first successful projects of the genre known beyond Japan (although it is possible to play in it only by connecting a Japanese VPN). Following its example, in 2017 a Chinese game Azur Lane for mobile phones appeared. There are also ships from all over the world divided into fractions according to the countries (Japan, the USA, Great Britain, Germany, etc.). The ships are represented in a form of anime girls. The basis of the game is also gacha where after getting a character, one has to make a fleet and annihilate enemies. The plot in the game is given on the principle of visual novel. There is a skin shop in the game, where players can purchase alternative outfits for game characters and the most expensive skins are animated with Live2D technology. In September 2017 a Japanese version appeared, in May 2019 an English one with servers in the USA, in October 2019 versions for Hong Kong, Macau and Taiwan. The game is developed by a Chinese company Manjuu but dubbed in Japanese. In such games (there are a lot of them nowadays), characters address to gamers to a specific name. Indeed, in Azur Lane a gamer is called commander (from Japanese - shikikan). In a mobile game Fate / Grand Order a gamer is called master, in Arknights doctor. In this way, the author of the game creates a certain impersonal image of a gamer, which unites everybody who plays this game. In 2019 based on the game, the anime was released. The game also has a collaboration with the game World of Warships. The gamers optionally can download Japanese audio dubbing of real ships by the voices of anime girls from Azur Lane and anime liveries for them. Thus, it is possible to play an international game with Japanese audio

dubbing. On the Internet, virtual youtubers (vitubers) advertise a game Azur Lane, and then, during a game event they are added to the game as in-game characters who a gamer can obtain. After that, the virtual youtubers play this game on video streams and try to get themselves. The example of this interaction is available on YouTube (Azur Lane, 2021). Trans-media narration is formed this way, with the aim of promoting the game with the help of online communication channels.

Visual novels are mainly a dating simulator with anime characters, and most of them are 18+ and exist only in Japanese and only for the Japanese market. Despite secrecy, the genre has become popular in the West. Some novels are translated and sold through the platform Steam (the official game distributor in the West). However, in the West these games are censored, e.g. Nekopara in 2014, and Dies Irae in 2017. A reverse process is quite vivid, when western developers create their own novels in this genre, and some of them later become popular in Japan, and even dubbed in Japan. This reverse process is a part of globalization of Japanese media in the world when a certain media based on the original, created beyond Japan, comes there from the West and localizes. Examples include Doki Doki Literature Club in 2017, and Sakura Fantasy in 2015.

A classic Chinese game mahjong in anime style is available in the application Mahjong Soul since 2019 from Chinese developers Azur Lane. Two servers work in the game: one separate for Japan, the other global for China, the USA, Europe and all the world. The interface on the global server is available only in Chinese and English, voiced are only in Japanese. Again, the role of the Japanese language here is obvious; it is a branding technology. The lack of Japanese interface and the presence of Japanese audio demonstrate that a developer encourages anime fans to its game from all over the world, including local citizens, in Japanese, although the game is not Japanese.

A Japanese game Nier: Automata from 2017 told about the world where humanity had died, and to survive on the Earth, a human-like mechanic robots and androids fought. The main character was an android-girl 2B who traveled around the world annihilating robots and searching for the sense of her existence. Her image became so popular in the west that caused a lot of cosplay, fan-art, and became a trend of mass culture. However, the game itself in spite of a sex-symbol character, in fact turned out to be a philosophic parable about the search of a life sense, existential crisis. It considered the problems of existence and referred to famous European philosophers and the Bible. Indeed, the game had the following characters: Jean-Paul Sartre, Simone de Beauvoir, Pascal, Adam and Eve. The main plot thesis was based on Nietzsche's philosophy. Thus, we can observe a convergence of cultures (Jenkins, 2004a, 2004b) when a European philosophy becomes the basis of plot and is given through the prism of the Japanese worldview in a Japanese game, which unites aesthetics of the East and philosophy of the West.

A Chinese anime style game Genshin Impact from 2020 is a role-playing game in the open world where a gamer choses where to travel by oneself. It is remarkable because it gives a player the opportunity to play on different platforms: mobile devices, PC, and game-console PlayStation 4, although usually mobile games do not have such option. The game is free-toplay, but it has a paid content. During the first four days, 17 million users downloaded it; during the first fortnight since the release, the game brought its developers more than 100 million US dollars. It is available with the audio dubbing in four languages: Japanese, Chinese, Korean and English, as well as with subtitles in many languages. Thus, China borrows the concept of Japanese mass culture and globalizes it, which, as a result, brings a great income and popularity.

Western game service Steam gives an opportunity to set Japanese audio dubbing if fans want, in some cases it costs money. In this case, the Japanese language is not only an element of branding but also an additional content of western media (e.g. The Witcher 3, 2015, and Life is Strange, 2015).

3.3.2 Online anime-styled characters

Vocaloids are voice synthesizers, the principle of which was introduced by Yamaha corporation in 2004. To create a vocaloid, a 'voice provider' (usually famous Japanese voice actors or vocalists) records each phonetic sound of the Japanese alphabet (or any other language) in a studio. Then, these sounds are transformed into voice samples of a music editor - vocaloid voicebank. It is possible to edit voice samples in the program: to change a key, pitch, and sound length. A complete vocaloid receives a name and anime-style avatar. Purchasing the program, everyone can create one's own music and use the vocaloid as a vocalist for one's instrumental tracks. This person is called a vocaloid producer. It can be both an amateur and a professional or sound recording corporation. The most famous vocaloid, who is no doubt one of the symbols of Japanese mass culture, is Hatsune Miku. Roseboro proves that by stating that "despite being a fictional character, Miku has opened for Lady Gaga's 2014 ArtRave tour (most notably at Madison Square Garden in New York), appeared on David Letterman's Late Show, collaborated with Pharrell Williams on a remix of 'Happy' for the film Jellyfish Eyes, has been

included in multiple iterations of the Just Dance video game series, and has served as creative inspiration for designs by Marc Jacobs" (Roseboro, 2019, p. 26). There are even concerts organized for Hatsune Miku where she sings from a large screen or as a 3D model or hologram (Miku, 2018). Other popular vocaloids are Megurine Luka, Kagamine Rin and GUMI. Vocaloids can be male or female. Unlike virtual youtubers, vocaloids are absolutely virtual characters that sing and talk with the help of the text typed in advance in a computer program.

Virtual youtubers are the authors of streams and video on YouTube who perform live broadcast and communicate with the viewers on behalf of a digital anime avatar. The avatar is generated in a real time with the help of computer graphics. A special equipment or web camera reads mimicry and movements of a real person. Therefore, the viewers get the impression that they are talking online with a real anime character. Professional seiyu (Japanese voice actors) as well as amateurs voice vituber characters and conduct streams on their behalf. Wilde (2019) believes that nowadays characters, such as vocaloids or vitubers, are the key elements of media convergence in Japan: "... many character theories in recent years are essentially thought of as transmedial: applicable to representations of characters through a variety of media (e.g. film, television, comics, video games, etc.)" (Wilde, 2019, p. 4). "Characters can not only be considered the 'currency' of and between different forms of media. In many cases, they also serve as a kind of 'fuel', as an incentive for both dynamics mentioned above" (Wilde, 2019, p. 4). The most popular Japanese virtual youtuber Kizuna Ai has more than 2.5 million subscribers on her channel. There is also a Japanese vituber agency Hololive, that manages Japanese, Vietnamese and English-speaking vitubers. The most popular English vituber Gawr Gura has over 1 million subscribers on YouTube. The main goal of vituber streams is an entertainment for anime fan audience. Vitubers sing anime songs, play games, discuss a wide range of topics relevant for anime fans. They often make absurd and even risque jokes about themselves, make collaborations and use rude words in a cute way to attract audience. They also make different references to Japanese pop culture, which could be understood only by those who knows Japanese mass culture in depth. Thereafter, to be a successful virtual youtuber, a person must be a pop cosmopolitan, no matter one is Japanese or non-Japanese. Even English-speaking vitubers tend to learn or know Japanese language in order to be at the same level with their audience, and know a lot about anime, manga and games. Respectively, being a pop cosmopolitan becomes for them a professional requirement to do such a job. Therefore, the concept of the new pop cosmopolitanism can be useful nowadays, as it opens the new ways for people to work in media sphere.

3.3.3 Manga and anime franchise

Love Live! (2013) started with manga and music video clips. It tells about nine girls from a high school who become idols (Japanese young pop singers) to win a music contest, draw attention to their school and save it from closure. Later, two anime seasons and a full-length anime film were released. To increase the sales of anime disks, they were accompanied with a ticket to the actors' concert (merchandizing). These actors voiced anime characters; in this concert, they performed on behalf of their characters. In addition, a mobile game was released where one had to gather anime characters and perform with them at the concerts. It was based on gacha principle and was a kind of rhythm game where one has to press the notes in time with the music. Afterwards, a sequel was released about nine other girls from another school, and in autumn 2020 an anime appeared about the third generation of school idols. In the sequel of Love Live! Sunshine the location is changed from Tokyo to a Japanese provincial town Numazu at the seaside. The main character Takami Chika has become an official Ambassador of tangerines sale of Nishiura Mikan (merchandizing). Moreover, due to the anime, a town Numazu has become so popular both with Japanese and foreign tourists that the locals even started to complain about some inconveniences caused by a great number of tourists. Sewer hatches painted with anime characters from Love Live! Sunshine were also installed in the town (merchandizing).

Uzaki-chan wa Asobitai is a manga in a romantic comedy genre, which was later adapted into TV-anime (2020). It was also advertised in vitubers style when the main character Uzaki Hana in the image of a vituber seemed to be playing a game and then called to buy a new volume of manga (Kadokawa, 2018). She has become an official ambassador of Red Cross in Japan (merchandizing). There were posters with the character in Tokyo where she called to donate blood (Uzaki Hana, n.d.).

3.3.4 Anime streaming services

Anime officially gets abroad through streaming services that license the official content, choosing which anime will be popular in certain regions. On American services Crunchyroll, Netflix and Funimation, anime is translated not only into English but also into European languages. In France and Russia there is a similar service Wakanim. Having a monthly subscription, a user gets an access to the archive of licensed anime. These services closely cooperate with Japanese anime studios, ordering and financing anime production, which according to their estimation will be popular in the West. For example, Netflix ordered remakes and sequels of old anime Baki and Devilman in 2018 that are popular in the West. They are unlikely to be filmed by the Japanese because of financial non-profitability, as in Japan these shows did not gain the same success as in the West. Also in the West, so called live actions are filmed. These are anime screen versions with real actors, e.g. Ghost in the Shell and Death Note.

The largest streaming anime service with more than 55 million visitors monthly is Crunchyroll; 42 % of users are from the USA. The service specializes in anime with Japanese audio and subtitles in different languages. Its competitor Funimation specializes in sales of anime with English dubbing online and releases it on disks as well. The site traffic is 9.8 million monthly, 73 % of which is from the USA. In 2017 a Japanese company Sony purchased Funimation for 150 million US dollars. According to Khan (2021), in August 2021 Sony bought Crunchyroll for about 1.2 billion US dollars. This shows the desire of Japanese business to control the spread of anime all over the world because of the increase in its popularity, and they are ready to pay a high price.

Service Netflix mainly specializes on TV series and documentaries of their own production. There are not

many anime and it is not a priority, however, a Japanese branch Netflix Japan broadcasts anime for the Japanese making an alternative to anime viewing on TV. The second season of a popular anime Re:Zero, which is also broadcast on TV, became the most popular show on Netflix Japan in August 2020.

Korean online platform Naver has ordered from a Japanese studio TMS Entertainment the anime based on Korean manhwa Tower of God in 2020. Thus, the Japanese according to the Korean order made the anime based on the Korean comics. After the premiere in Korea, the anime was also shown in Japan on TV and in the West through the American service Crunchvroll for the western audience, demonstrating the efficiency of the new pop cosmopolitanism. Anime spreading in a national-global trend happens the following way: Japanese anime studio makes an anime, then it is broadcasted on TV in Japan (local level), next the series, licensed by western companies, with a minor delay after premiere on Japanese TV become available on streaming services such as Crunchyroll for the whole world (global level), inculuding Japan, bringing it back to the local level (see Figure 2).



Figure 2: The scheme of anime spreading in trend national-global

At the end of the second season of anime Sword Art Online: Alicization – War of Underworld in 2020, the memories of the main characters according to the plot are uploaded to the server in a digital format; the IP address 52.68.96.58 is shown. If a user enters it into one's own browser, one is redirected to the anime webpage, which says "Our memories are right here". The authors connect fictional space of the imaginary world with the reality enabling the viewer to interact with it. If a viewer watched the anime on TV, one is redirected to online updating cross-media practices. For the details of cross-media practices, see the Japan's cross-media systems: features of functioning in the local market (Paschenko, 2017).

3.3.5 Transcultural anime fandom

Fan labour and works also make their contribution to the globalization of Japanese mass culture. There are few different kinds of activities fans usually do in order to share anime, manga or games they like in their country (e.g. making a fan translations to their language) or to simply express themselves (drawing a fan-made comics about their favorite characters, doing cosplay or drawing a fan art). Hye-Kyung Lee (2011), describing fansubbing and scanlating, states that "Enthusiastic fans obtain - buy, record from TV or download - overseas audiovisual products, translate the original language into their own, provide subtitles and release the subtitled version on the internet for other fans, without asking permission from the relevant copyright holder" (Lee, 2011, p. 1131). From the one hand, fansubbing and scanlating of licensed manga and anime is regarded as a form of media piracy by copyrights holders, but from the other hand, it helps to globalize Japanese media mix in countries where it is not officially accesible. "Accessing and consuming foreign cultural products via 'fan-translation' has become an everyday part of life for many ordinary cultural consumers in different sections of the world from the US to China", thinks Lee (2011, pp. 1131-1132). Fans in Japan and overseas also engage themselves in drawing fan works dedicated to their favorite anime, game or manga. It is called doujinshi, which stands for a self-published piece of work (manga, game, music, etc.) made by a group of fans with the same interests or by a single person. Doujinshi also can be original works. In Japan, lots of doujinshi works are sold at the Comiket, the biggest comic festival which is held twice a year. Fans around the world also draw doujinshi: in the USA, in the Netherlands, in Germany and many other countries (Lamerichs, 2013, pp. 158-165). Fans also create tones of fan art (simply anime-styled fan-made drawings dedicated to a certain character or title), and upload it to imageboards. One of the most popular fan art themed websites is Japanese Pixiv. Fans also engage in cosplay, when they dress up as their favorite character, take photos and share it within community. This practice became popular among fans from different countries and illustrates the progress of globalization of Japanese pop culture around the globe (Lamerichs, 2013, pp. 167–173). Fan labour such as anime fansubbing or manga scanlating are made mostly on voluntary basis, but fan works such as doujinshi or fan art can also be monetized by their authors. They either sell their works at the comic festivals and online or receive donations via crowdfunding (e. g. using Patreon website).

4. Discussion

The research results prove that on a global level in a mediatized society, it is not important which country produces the product of mass culture - no matter whether the product is artificially connected with a certain area (in our case, Japan) by franchise, language, characters, and symbolic elements or media technologies. Culture and language act as mediators passing through them the products of other areas, creating the elements of pop cosmopolitanism discourse on a global level with bright national features. The arguments for this statement can be the data as for the quantity of followers of American streaming service Crunchyroll, where there are more than 1000 anime, only 49 of which are dubbed. The others are in Japanese with subtitles in different languages: English, Spanish, Portuguese, French, Italian, German, and Russian. Crunchyroll has more than 3 million paying subscribers and more than 55 million site visitors monthly; the data are retrieved from Similarweb (2021). Of these 42 % are from the USA, then Brazil, Canada, Australia, and Great Britain. One of the Crunchyroll's competitors is American streaming service Funimation. It specializes more on anime dubbed in English and Spanish. It is less popular and has approximately 1 million paying subscribers (Nikkei Asia, 2020) and 9.8 million users monthly, 71 % of whom are from the USA, then Canada, Great Britain, Australia, and Brazil (Similarweb, 2021). Crunchyroll is much more popular than Funimation, which proves that millions of people want to take anime in the original language; the availability of audio dubbing is not important and not necessary for them.

Japanese mass culture together with the language appeals to the emotive level of consumerism through the systems of lovely characters, emotional stylistics and a great number of opportunities on services market: from souvenirs with beloved characters to dressing up (cosplay), etc. This approach turns out to be surprisingly effective in various forms of social interaction. In fact, Armour (2011) is sure that the use of anime and manga while learning Japanese makes the process funny and encourages people to study. Nowadays, a lot of people all over the world play Japanese games, and when playing western games, set the Japanese language for audio instead of their native language. Service Steam gives such opportunity enabling to download the Japanese language into a French game Life is Strange. Chinese mobile game publishers Yostar, Inc. make the games in Japanese in order to sell them to the West. At the same time, some of them do not even have a Japanese version: only Chinese and English one, but audio is only in Japanese. And that is not to mention a great number of works imitating the Japanese originals which are created all over the world: Amerimanga, manhwa (Korean and Chinese manga), American cartoons in anime style, European magazines of manga (e.g. in Ukraine MIU manga), etc. Besides, cosplay, fan-art and doujinshi (unofficial manga from the fans based on official anime or manga works or original stories).

Globalization of Japanese mass culture is spread around the world and forms a branched cross-media system that connects not only local media channels but also converges global information space. Mass culture dates back to traditional media and develops the content further spreading it to different platforms. This strengthens the effects of mediatization on local cosmopolites.

This process is schematically represented in Figure 3, which shows via what media channels local cosmopolite in Japan gets one's pop culture products and how they are connected with each other in the full-blown cross-media system. Thus, a mass culture recepient gets access to an anime via TV or the Internet, but also can buy it on BD or DVD disks after TV broadcast is over. A customer can read manga in magazines or tankobon books, and then this manga can get an anime adaptation. Gamers get their games on disks, on the Internet or via mobile device application stores, and their games can be adapted into manga or anime. Music fans get their favorite songs on CD or via the Internet, and after that they can hear them as an anime music theme or even get an anime about their favorite idol band. All of the elements are interconnected in a diverse cross-media system via different media channels and they all can enter a global level afterwards.

Speaking about mediatized space, we should focus on the levels of mass culture product consumption. A full perception of national media discourse happens from inside. Here, there is a division of cosmopolites into local and comprehensive. Certain circles of connoisseurs watch anime only in the original language because in their opinion, any dubbing spoils anime. Others take the translation harmoniously, and somebody needs to visit a country (to which the anime is situated) for full immersion. The level of cosmopolitanism depends on the level of a person's understanding the context and the realities of the other country that he wants to belong to, in our case – Japan.

A local cosmopolite is aware of the topic but accepts Japan like "they are there – we are here". To understand some peculiarities of another culture and history, local cosmopolites need special explanation, e.g. translators' comments in subtitles to anime that explain the



Figure 3: The scheme of mediatization of mass culture products on a global level, oriented on local cosmopolites

context. A comprehensive cosmopolite understands the context without explanations. For example, the foreigners who moved to Japan and have lived there for a long time, or the foreigners who were born in Japan and live there, know two languages perfectly. They do not consider themselves Japanese; however, they know the local culture as well as the locals.

Thus, a question arises: is it possible on the local level of new pop cosmopolitanism in mediatized global space to consider the language as an element of branding and transform it into the rank of technology by adding the function of mediation, according to Fornäs (2014)? The answer to this question is rather disputable and requires a further study.

5. Conclusions

New pop cosmopolitanism that is based on Japanese mass culture is spread through a branched system of media channels by which a consumer gets a media content to consume it in the Japanese language: TV, radio, the Internet, press, books, mobile apps, cinemas, computer games, physical disks, and merchandizing. Franchise surrounds consumers all around involving them into a large amount of content, which is one of the main characteristics of cross-media systems. A national product, thanks to mediatization, reaches a global level penetrated by glocalization practices that are implemented through the concept of the new pop cosmopolitanism.

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TOPICALITIES

Edited by Markéta Držková

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News & more

A regular update on ISO standards for graphic technology

This time, the news on the standards in the field of printing and graphic technologies that are developed under the direct responsibility of the technical committee ISO/TC 130 are more extensive. Among the reviewed documents, those reconfirmed during the last 12 months include ISO 2846-2:2007 Graphic technology – Colour and transparency of printing ink sets for fourcolour printing – Part 2: Coldset offset lithographic printing, ISO 12218:1997 Graphic technology - Process control - Offset platemaking, ISO 12640-3:2007 Graphic technology - Prepress digital data exchange - Part 3: CIELAB standard colour image data (CIELAB/SCID), ISO 12645:1998 Graphic technology – Process control - Certified reference material for opaque area calibration of transmission densitometers, ISO 15076-1:2010 Image technology colour management - Architecture, profile format and data structure - Part 1: Based on ICC.1:2010, ISO 16612-1:2005 Graphic technology - Variable printing data exchange - Part 1: Using PPML 2.1 and PDF 1.4 (PPML/VDX-2005), two parts of ISO 15930 Graphic technology – Prepress digital data exchange using PDF from 2010 – Part 7: Complete exchange of printing data (PDF/X-4) and partial exchange of printing data with external profile reference (PDF/X-4p) using PDF 1.6 and Part 8: Partial exchange of printing data using PDF 1.6 (PDF/X-5), ISO 16612-2:2010 Graphic technology - Variable data exchange - Part 2: Using PDF/X-4 and PDF/X-5 (PDF/VT-1 and PDF/VT-2), and ISO 12640-1:1997 Graphic technology - Prepress digital data exchange - Part 1: CMYK standard colour image data (CMYK/SCID). Further, ISO 16763:2016 Graphic technology - Post-press - Requirements for bound products, ISO 12632:2015 Graphic technology - Ink, paper and labels - Requirements on hot alkali penetration and resistance, ISO 14861:2015 Graphic technology - Requirements for colour soft proofing systems, ISO 17972-1:2015 Graphic technology - Colour data exchange format - Part 1: Relationship to CxF3 (CxF/X), ISO 18619:2015 Image technology colour management - Black point compensation, as well as four technical reports: ISO/TR 12705:2011 Graphic technology - Laboratory test method for chemical ghosting in lithography, ISO/TR 14672:2000 Graphic technology - Statistics of the natural SCID images defined in ISO 12640, ISO/TR 15847:2008 Graphic technology - Graphical symbols for printing press systems and finishing systems, including related auxiliary equipment, and ISO/TR 16066:2003 Graphic technology - Standard object colour spectra database for colour reproduction evaluation (SOCS) were confirmed for the first time. Also, the list of the standards and technical specifications published recently is longer than usual; therefore, only the new ones are described below, while the revised editions are presented in the side column.

ISO 12642-3:2021 Graphic technology – Input data for characterization of 4-colour process printing Part 3: Extended data set including near neutral scale

A data set defined in this new standard from September 2021 is designed for all general applications, especially those using neutral-scale calibration and CMYK inks, with no required layout or patch size. It is meant as an alternative to the data set provided in ISO 12642-2:2006 (reconfirmed last year), replacing its duplicate patches with the new ink value combinations.

The revised editions of graphic technology ISO standards

Besides the new editions that replaced the previous versions of standards and are briefly introduced in the following text, Amendment 1 to ISO 21632:2018 Graphic technology – Determination of the energy consumption of digital printing devices including transitional and related modes was published in November 2020.

ISO 2834-1:2020 Graphic technology – Laboratory preparation of test prints Part 1: Paste inks

In contrast to the original edition from 2006, the new version released in November 2020 describes a general procedure for the preparation of well-defined test prints on paper, board, metals, foils and other suitable substrates for the use by several existing as well as future standards. It specifies the instruments required for tests, namely the IGT-type and prüfbau-type printability testers that are electrically driven, the materials and their conditioning, sample preparation and the test procedure. The reference test and ink, as well as roller conditioning and maintenance of elastomer rollers, are described in the annexes.

ISO 2836:2021 Graphic technology – Prints and printing inks – Assessment of resistance of prints to various agents

The fourth edition available since this May replaced the previous one from 2004. With new agents added in the current version, this standard defines the methods to test the interaction of liquid and solid agents, solvents, varnishes and acids with prints on all substrates produced by conventional as well as digital processes. It does not cover food safety and food contact materials.

ISO 12635:2021 Graphic technology – Plates for offset printing – Dimensions

The third edition of this standard that specifies the width, length and thickness of unprocessed metal lithographic printing plates, and for computer-to-plate applications also their flatness, edge straightness and burr requirements, was published this June and replaced the previous version from 2008. In an effort towards higher standardisation, the current revision defines the preferred (most widely used) plate dimensions.

ISO 12647-8:2021 Graphic technology – Process control for the production of half-tone colour separations, proof and production prints Part 8: Validation print processes working directly from digital data

Replacing the first edition from 2012, the new one published this May uses ΔE_{00} colour difference formulae, adds a better metric for uniformity assessment and a more contentoriented control wedge, as well as the technical requirements for validation print conformity in a new appendix.

ISO 14298:2021 Graphic technology – Management of security printing processes

This standard specifies a minimum set of requirements on security printing management system. Compared to the first edition from 2013, the changes in the new edition published this August comprise mainly the updated definitions to comply with the latest ISO/IEC Directives.

ISO/TS 15311-1:2020 Graphic technology – Requirements for printed matter for commercial and industrial production Part 1: Measurement methods and reporting schema

The second edition from 2019 (see JPMTR Vol. 8, No. 3) was soon replaced by this one published last December. It adds definitions for colour gamut, macroscopic uniformity, perceived resolution, display window indoor light stability, and contouring.

ISO 12647-9:2021

Graphic technology – Process control for the production of half-tone colour separations, proof and production prints Part 9: Metal decoration printing processes using offset lithography

This new standard from the ISO 12647 series published in June 2001 defines the printing requirements for the metal decoration market based on the colour values of a typical white-coated metal substrate, e.g. for boxes and cans.

ISO 15930-9:2020

Graphic technology – Prepress digital data exchange using PDF Part 9: Complete exchange of printing data (PDF/X-6) and partial exchange of printing data with external profile reference (PDF/X-6p and PDF/X-6n) using PDF 2.0

Since last November, the PDF/X family of standards has been extended by this new one, defining the use of ISO 32000-2 (PDF 2.0) and supporting Gray, RGB, CMYK and n-colourant characterisation spaces, as well as colour-managed data. In contrast to previous parts, this one allows annotations, including digital signatures, form fields and videos, in the printable area of a page.

ISO 16612-3:2020 Graphic technology – Variable data exchange Part 3: Using PDF/X-6 (PDF/VT-3)

This new standard for variable data and transactional printing from November 2020 is based on ISO 32000-2 as restricted by ISO 15930-9 (see above).

ISO/TS 18621-21:2020 and ISO/TS 18621-31:2020 Graphic technology – Image quality evaluation methods for printed matter Part 21: Measurement of 1D distortions of macroscopic uniformity utilizing scanning spectrophotometers Part 31: Evaluation of the perceived resolution of printing systems with the Contrast-Resolution chart

These two new parts of the ISO/TS 18621 series were published last November and December, respectively. The first one defines evaluation of the horizontal and vertical homogeneity using the Macro-Uniformity-Score; its next edition is now under development. The second one specifies the procedure to characterise the perceived resolution using the dedicated test chart.

ISO 20616-1:2021 Graphic technology – File format for quality control and metadata Part 1: Print requirements eXchange (PRX)

While the second part of this series was presented in this section a year ago, the first part was published in September 2021. It specifies an extensible file format for the exchange of data and metadata with customer print quality requirements between the relevant applications and systems.

ISO 22934:2021 Graphic technology – Communication of offset ink properties

The requirements defined in this new standard from May 2021 aim to ensure the properties of inks are appropriate for the intended use of the printed product and facilitate the optimised planning of print production.



Book Wars The Digital Revolution in Publishing

This book provides a valuable insight into the digital transition of the oldest of the media industries, the book publishing industry. The text draws on two decades of the study focused on Anglo-American publishing, namely hundreds of in-depth interviews with industry representatives from large trade publishers to small organisations or individuals. While most of the research for this book was done between 2013 and 2019, the author also makes use of some information gathered for his previous two publications – Books in the Digital Age: The Transformation of Academic and Higher Education Publishing in Britain and the United States (2005) and Merchants of Culture (2009).

The comprehensive text of the current book gives a historical perspective on the changes coming with digitalisation and shows how the modern book publishing industry can absorb and adapt to the digital revolution, stressing the importance of the social context in the adoption of new technologies. It also highlights the upsides, especially many kinds of publishing models and channels that increase the chances of writers to get published and engage with readers. The significant point for the publishing ecosystem is the need to reach out to readers to reduce the dependence on large booksellers and retailers, especially Amazon. Independent booksellers are still able to maintain personal relationships and meet the needs of readers but only on a local level. Overall, the book brings a detailed account of the present book publishing landscape and provokes discussion among all interested in books and their future.

The first three chapters deal with ebooks, analysing in detail their share of total book sales, both overall and for individual genres, exploring new forms of the book made possible through the digital format and the features that differentiate, or may differentiate, ebooks from printed editions, and discussing the copyright issues related to the backlist titles and their digital publishing. Then, two chapters describe the impact of Google and Amazon; while the main concern in the case of Google is copyright and access to the digitised content, in the case of Amazon, it is its dominant position on the market reached through the systematic gathering of customer details exploited in the effective marketing. The next chapter discusses the resulting struggles for visibility. The following three chapters present the options of self-publishing, crowdfunding and BookFlix. The last three chapters before the book's conclusion deal with audiobooks, storytelling in social media and the coexistence of old media with the new ones. In addition, the appendices provide the sales data from a large US trade publisher and an account of research methods and sources. The book includes selected case studies as well as figures and tables based on the available data and information acquired through interviews. While some sources are directly quoted, others are mentioned under pseudonyms or fully anonymised, in accordance with their preferences.



Author: John B. Thompson

Publisher: Polity 1st ed., April 2021 ISBN: 978-1-509-54678-7 526 pages Hardcover Available also as an eBook



Light—Science & Magic An Introduction to Photographic Lighting

Authors: Fil Hunter, Steven Biver, Paul Fuqua, Robin Reid

Publisher: Routledge 6th ed., April 2021 ISBN: 978-0367860264 336 pages, 267 images Hardcover Also as an eBook



This book helps to understand the nature and principles of light and how to light "any sort of subject in any location or circumstance". Now in the sixth edition, it explains the concepts of light and lighting, types of reflections, how to control the surface appearance, reveal shape and contour, light metal and glass, set up lights for making portraits, and deal with extreme lighting and scenes. In addition, it discusses the equipment needed when working on location and in the studio, together with the appropriate approaches. It also includes new illustrations and an updated list of reliable suppliers.

Managing 3D Printing Operations Management for Additive Manufacturing

Editor: Daniel Eyers

Publisher: Palgrave Macmillan 1st ed., March 2020 ISBN: 978-3030233228 208 pages, Hardcover Also as an eBook



This new book discusses technology adoption models, implementation scenarios and flexibility strategies for 3D printing, its sustainability, spare parts manufacturing, craft production, and a cost–service relationship for ondemand 3D printing. It also presents a new framework for 3D printing implementation with evidence from the industry, the current range of 3D printing services and their provision business models, along with a future outlook on the role of 3D printing in supply chains and circular economy.

Photography A 21st Century Practice

The intention of the authors of this book was to help its readers in becoming photographers who craft powerful images worth to get recognised among myriad other photos taken and posted online every day while also covering all fundamentals necessary to acquire the appropriate technical skills. The content of the textbook is organised into chapters dealing at first with the basics – devices, optics, exposure, composition, light, post-production, and prints, then discussing the significance of content and concept, including craft and composition, as well as development and presentation, and finally presenting the analogue photographic processes, video, computational photography, and also the use of words, which are not a primary means of communication for visual artists but still may strengthen a storytelling potential of photography.

The textbook includes step-by-step demonstrations, numerous hands-on exercises as well as questions to think about and discuss. To illustrate the presented concepts, the volume features works of many outstanding artists, often complemented by the analyses of their approaches and careers to provide more in-depth insight.



Authors: Mark Chen, Chelsea Shannon

Publisher: Routledge 1st ed., June 2020 ISBN: 978-0-367-55352-4 682 pages, 1 000 images Hardcover Available also as an eBook

Media Management Strategy, Business Models and Case Studies

This textbook introduces the main concepts of media management. The author tracks the development of media management, reflecting the development of media and communication applications, outlines the characteristics of media management and value creation systems of media enterprises, describing core assets and competencies as well as business models, and defines functions of media management. Eight chapters detail business models and value creation in the newspaper and magazine market, book market, movie market, TV market, radio market, music market, video and gaming market, and internet market. The text also covers international media management and cross-media management. The last chapter provides the Google/Alphabet case study and eight other market-specific case studies.

Author: Bernd W. Wirtz

Publisher: Springer 2nd ed., September 2020 ISBN: 978-3-030-47912-1 327 pages, 141 images Hardcover Available also as an eBook



Ink under the Fingernails Printing Politics in Nineteenth-Century Mexico

As the author disclosed in her post on UC Press Blog after publishing this book, she originally intended to study printers as artisans and workers, but her archival research that included government ministry papers, supreme court records and legal files revealed the significant role of printers in liberal state formation in 19th-century Mexico and efforts towards press freedom. Drawing on extensive sources, the book provides a detailed insight into printing shops in the post-independence era with a focus on Mexico City. It discusses censorship, regulations of printing and press confiscations, along with their reflection in public debate, the later shift in official thinking and printing used as a tool of nation-building, as well as commercial expansion of printing. The story is illustrated through archived prints ranging from type specimens to broadsides posted on street walls and preserved as the investigation evidence, also documenting the imagery and typefaces used.



Author: Corinna Zeltsman

Publisher: University of California Press 1st ed., June 2021 ISBN: 978-0-520-34433-4 350 pages, 37 images Hardcover Available also as an eBook

Designing Science Presentations A Visual Guide to Figures, Papers, Slides, Posters, and More

This concise guide with clearly organised content and well-chosen illustrations covers all important aspects and good practices worth considering when preparing science presentations. The first part briefly outlines the topic and design goals for different presentation formats. The next one, which comprises about a third of the book, deals with the individual visual elements - colour, typography, words, tables, graphs, diagrams, and photographs. The remaining four parts are focused on written, slide, oral, and poster presentations. Here the author discusses specifics of research articles, review articles and research proposals, various factors influencing the quality of a slide presentation, including its structure, choice of visual elements, slide layout, animations and transitions, delivery of slide presentation and proper use of technology, considerations for different categories of the slide and oral presentations, and finally the composition, visual design and layout of a poster as well as its presentation at a poster session. Further recommendations on literature, software, designing from scratch and using design principles to market oneself can be found in four appendices.

Author: Matt Carter

Publisher: Academic Press 2nd ed., November 2020 ISBN: 978-0-12-815377-2 368 pages Softcover Available also as an eBook



The Periodical Press in Nineteenth-Century Ireland

Author: Elizabeth Tilley



Publisher: Palgrave Macmillan 1st ed., March 2020 ISBN: 978-3030300722 309 pages, Hardcover Also as an eBook

This work draws on the study of a selection of weekly and monthly periodicals published in 19th-century Ireland. These comprise two titles that appeared in the period of Napoleonic wars and reflect the difficulty to articulate Irish identity in print at that time, two intellectual and two popular titles to examine connections between them, a monthly title published for more than 40 years, a trade journal, selected nationalist periodicals published by James Duffy, and two titles representing the New Iournalism at the end of the century. A contemporary account of the Irish publishing industry is provided in the appendix through the excerpts from a series published in one of the examined journals, The Irish Builder, from July 1877 to June 1878.

A History of Data Visualization and Graphic Communication

Authors: Michael Friendly, Howard Wainer



Publisher: Harvard University Press 1st ed., June 2021 ISBN: 978-0674975231 320 pages, Hardcover Also as an eBook

Ten chapters of this book present the development of data visualisation from the first chart of statistical data back in the middle of the 17th century up to the present dynamic and interactive applications, exploring the different approaches to the graphic representation of various kinds of data and the progress in visualisation tools enabled by the technological advances, as well as the rare cases when visualised data communicate emotions and feelings.

Materials and the Environment Eco-informed Material Choice

Author: Michael Ashby

Publisher: Butterworth-Heinemann 3rd ed., January 2021 ISBN: 978-0128215210 448 pages, Softcover Also as an eBook



The present thoroughly updated and expanded edition of this book offers a clear account of the topic. First, the author provides the context of the increasing dependence on materials and energy and the rate of resource consumption. Next, he discusses the life cycle and its assessment, as well as the chances to reuse, repair or recycle products and materials and thus reduce waste. One chapter reviews environmental legislation. followed by the visual presentation of the important material attributes. the introduction of eco-audit methods and tools, as well as eco-audit case studies. The remaining chapters consider various aspects of material selection, including supply-chain risk. circular materials economics and sustainability. The relevant curated data for informed selection of materials by engineers and scientists are provided in two appendices.

Synthesis and Applications of Nanocarbons

Editors: Jean-Charles Arnault, Dominik Eder

Publisher: Wiley 1st ed., September 2020 ISBN: 978-1119429388 320 pages Hardcover Also as an eBook



This book reviews the progress in nanocarbon research. After an overview of graphite and diamond properties, it deals with fullerenes, spherical carbons, carbon nanotubes, hybrid carbon nanotube fibres, nanodiamonds, nanocarbon aerogels and aerographite, including the optoelectronic properties of nanocarbons and nanocarbon films.

Things Fall Together A Guide to the New Materials Revolution

Skylar Tibbits, the founder of the Self-Assembly Lab at MIT, the Massachusetts Institute of Technology, provides the readers of this book with thoughtprovoking insights into the emerging research towards the active materials capable to sense, interact, adapt, transform, self-organise, and even evolve. While the development since the Industrial Revolution vastly aimed to restrain materials into standardised components with the lowest possible sensitivity to the changes of the surrounding environment to maximise their stability, the author foresees avenues of new design possibilities through appreciation for material intelligence instead of what he names alienation from materials. New ways of creating material properties are becoming possible thanks to digital fabrication technologies and research advances, especially in synthetic biology and materials science. This book shows how simple materials can be programmed to create active matter on any scale. That is the approach to design smarter products without the extra components, cost, and complexity.

Author: Skylar Tibbits

Publisher: Princeton University Press 1st ed., June 2021 ISBN: 978-0-691-17033-6 224 pages, 42 images Hardcover Available also as an eBook



Surface and Interface Science Volume 9: Applications of Surface Science I Volume 10: Applications of Surface Science II

The last two volumes of this comprehensive handbook, which has been published since 2012, cover different application areas of surface science. The topics of their 20 chapters encompass thin films deposited by sputtering and physical vapour deposition methods, wafer bonding, superconformal deposition, spintronics, organic light-emitting diodes and approaches to increase their efficiency, dye-sensitised solar cells, electronic noses (including the inkjet-printed sensors), batteries, and fuel cell research in Volume 9, and surface analytics with X-ray photoelectron spectroscopy and Auger electron spectroscopy, applications of graphene including flexible electronics and 3D printing, catalysis, triboelectric charging including its application in electro-printing, friction, flotation, corrosion, the electrochemical transformation of organic molecules, and self-cleaning superhydrophobic or superomniphobic surfaces in Volume 10.

Editor: Klaus Wandelt

Publisher: Wiley-VCH 1st ed., March 2020 ISBN: 978-3-527-41381-2 941 pages Hardcover Available also as an eBook



B<mark>ookshe</mark>lf

Academic dissertations

Improving the Interface Stability of Cross-Linked Films by Ink Formulation in Printed Organic Light Emitting Diodes

The focus of this thesis was on the stability of a cross-linked inkjet-printed layer against subsequent solvent exposure when printing the next layer, which is one of the decisive factors for the successful production of multilayer printed electronics. In particular, the studies were aimed at crosslinking efficiency and polymer–solvent interaction in solution in the case of materials used in the production of OLED devices.

After providing the necessary theoretical background through a concise overview of organic light-emitting diodes, inkjet printing of thin films and polymer solutions used as inkjet inks, the dissertation introduces the investigated system along with materials and methods for its production and characterisation. The main studied hole-transport material comprised a random copolymer containing triarylamine units, in part carrying the styrene moiety as a cross-linker; the version without the cross-linkable groups was studied as well. Five solvents were chosen to have surface tension and boiling point in a range suitable for inkjet printing, while their chemical structures varied extensively in polarity. Two chapters then detail the characterisation of the resulting polymer solutions in terms of the affinity between polymer and solvent, the polymer size in solution, and the process of polymer cross-linking in bulk material as well as a thin film. The last experimental chapter deals with the inkjet printing of cross-linkable holetransport layer in uni- and bipolar OLED devices and the influence of the hole-transport ink on their performance in terms of electrical and optical properties and lifetime. Besides the solvent used for the hole-transport layer and emissive layer inks, the influence of annealing temperature is also discussed. Although the work studied only the organic light-emitting diodes, the presented comprehensive approach and the findings are relevant for the research of multilayer semiconductor devices in general.

Custom Inks and Printing Processes for Electronic Biosensing Devices

This thesis from the field of printed electronics deals with innovations in electronic ink formulation and printing towards personalised, comfortable, and easy-to-use printed point-of-care sensors. Attention is paid especially to the compatibility with delicate substrates to enable skin integration while minimising cost and environmental impact. The approach is based on the use of aerosol-jet printing as a method to deposit nanomaterials with the desired properties under the required conditions.

This dissertation provides the background on the methods and materials relevant to biosensors and printed electronics, describing the current trends and stating the current limitations. Notably, there is a need for cost reduction and form-factor metrics improvement in the case of medical tools for athome diagnostics. Printing is one avenue to address these concerns because versatile printing equipment can enable multi-material printing at a large scale. In development of biologically compatible inks, multiple factors must be considered: intrinsic properties and post-processing must be optimised

Doctoral thesis - Summary

Author: Pauline Hibon

Speciality field: Materials Science

Supervisors: Heinz von Seggern Edgar Dörsam

Defended: 11 September 2020, Technical University of Darmstadt, Material Science Faculty Darmstadt, Germany

Contact: hibon.pauline@gmail.com

Further reading: DOI: 10.25534/tuprints-00014138

Doctoral thesis - Summary

Author: Nicholas Xavier Williams

Speciality field: Materials Science

Supervisor: Aaron D. Franklin

Defended: 29 April 2021, Duke University, Department of Electrical and Computer Engineering Durham, North Carolina, USA

Contact: nxw@northwestern.edu Further reading: https://hdl.handle.net/10161/23049

Doctoral thesis - Summary

Author: Kai Lankinen

Speciality field: Engineering Sciences

> Supervisors: Jurkka Kuusipalo Mikko Hokka Johanna Lahti

Defended: 1 July 2021, Tampere University, Faculty of Engineering and Natural Sciences Tampere, Finland

Contact: kai.lankinen@marvaco.com

Further reading: http://urn.fi/ URN:ISBN:978-952-03-2027-0 and environmental impact must be minimised. The experimental work is presented in four chapters. The first of them describes the development and characterisation of silver-nanowire inks for direct deposition onto living tissue at room temperature, achieving high conductivities and ability to bend without degrading the printed layer. The functionality was demonstrated by printing a conductive trace onto a finger to power the light-emitting diode even when the finger is bent. Next, the possibility to use aerosol-jet printing of biological inks via ultrasonic delivery was verified by fabricating highly sensitive biosensors for carcinoembryonic antigen. In addition, the co-printing of biological and electronic inks was demonstrated. Further work, aimed towards fully printed and all-carbon recyclable electronics, used dielectric crystalline nanocellulose, semiconducting carbon nanotubes and conducting graphene inks to fabricate thin-film transistors, which showed stable performance over several months. It was also possible to prepare functional transistors printed with carbon nanotubes and graphene inks reclaimed using ultrasonic recycling. The same approach was applied to fabricate two types of lactate sensors. Finally, a fully printed, handheld biosensing device for the measurement of blood clot time was demonstrated, including a customdesigned, handheld control system with a 3D-printed case.

Evaluation of Expanded Gamut Printing in Flexography

This thesis deals with multicolour printing in solvent-based, wide-web flexography. The idea of expanded-gamut printing is not new and is increasingly discussed in the graphic arts industry as a solution that could improve the efficiency and sustainability in a reproduction of brand colours, especially in packaging printing. However, its implementation is slow, in part due to the lack of scholarly studies and reliable experimental evidence. Therefore, the thesis aimed to provide the data and test results to facilitate the transition.

The first chapter of the dissertation overviews packaging printing, colour theory and management, the factors affecting the quality of flexographic printing, with emphasis on colour systems and screens used, standardisation limitations and sustainability in flexography. The second chapter provides the experimental details. It introduces a novel calculator to estimate the efficiency of expanded-gamut printing in terms of the achievable benefits along with the tests used for verification and three designs for print tests, which comprised the reference profile test chart, gang-run job, and a legacy job with spot colours transformed for multicolour process printing. The third chapter presents and discusses the results obtained for expanded-gamut printing efficiency calculations and test designs, including image quality. Also, it briefly mentions the resulting opportunities for standardisation and sustainability. The main conclusion is that the calculations show great potential for efficiency increase and cost savings in several areas. Besides the press setup and downtime, improvements can be achieved through savings on the inks and ink storage, substrate and washing solvent regeneration. Further, linking the calculations with Overall Equipment Effectiveness, OEE, shows a potential improvement of 42-85 % and total yearly cost savings of about 0.6–1.3 million EUR per printing press. Similarly, the CO₂ equivalent can be reduced by 34-51 %. Regarding the colour gamut, the studied 7-colour system covers up to 91% of the Pantone Color Matching System with ΔE_{2000} of less than 3. Moreover, high-pigmented 4-colour inks expanded the colour gamut by 14%. Additional benefits can be achieved in the case of gang-run printing. Finally, the possibility of a real-world implementation of expanded-gamut printing was demonstrated for the legacy job, with keeping the quality acceptable to the brand owner.



Fall Conference 2021

Frisco, Texas, USA 3–6 October 2021



This event of the Flexographic Technical Association is held again as the live conference, with an on-demand option. The sessions cover the future outlook for flexography, standardisation, workflow improvements, and other innovations.

Printing for Fabrication 2021

https://www.imaging.org 11–13 October 2021



This year's edition, for the second time organised as an online event, opens a keynote by Yury Gogotsi dealing with MXene inks and possibilities of their applications for printed electronics. The presentation covers synthesis and prop-

erties of MXenes, i.e. 2D transition metal carbides and nitrides, as well as both aqueous and organic MXene ink formulations, together with examples of their use for extrusion printing, inkjet printing and screen printing on various substrates. The second keynote by Kye-Si Kwon is focused on directto-shape printing on non-flat surfaces, discussing the methods capable to apply high-viscosity inks to various geometries, including near-field electrospinning, continuous inkjet and needle-type dispensers. The conference programme features lectures and group discussions on deposition technology, circular economy of paper, experimental printing, system integration, direct-to-shape printing, and the impact of Covid-19 in the field.

Attendees have access also to the International Conference on Advanced Imaging 2021 held online a week earlier (3–8 October). For both conferences, the particular dates and times differ according to timezone, with the recordings available later for at least four months.

NAPIM Fall Technical Conference 2021



Oak Brook, Illinois, USA 12–14 October 2021

This conference organised by the National Association of Printing Ink Manufacturers aims to deliver current and accurate information on the issues important for the graphic arts industry. Its 2021 edition features presentations dealing with sustainability, communicating colour using digital colour standards, innovations in wax additive technology, quality control, chemicals risk evaluations and other relevant legislation, developments in UV LED technology, printed electronics, and more. The pre-conference course offered on the morning of the first day covers principles of printing ink formulation, milling and grinding operations, testing and technical support.

Cautious optimism reflected in the calendar of events

After the long months, the situation seems to be more stable with part of the events successfully taking place in person and the others mostly planned in advance to be held in the virtual format. However, some changes due to COVID-19 still occur, often as a result of uncertainties and their impact on attendance. The events cancelled for these reasons include the PRINTING United Expo 2021, with the new dates set to 19-21 October 2022 in Las Vegas, Nevada, USA, and this year's edition of the Paper & Plastics Recycling Conference, instead of which the organisers offer a webinar series on 20-21 & 26-27 October 2021.

Absolute Flexo Future 2021

Halmstad, Sweden 6–7 October 2021



This event offered by the Sweflex and Dansk Flexo Forum associations

presents the outlook for flexographic technology, discussing the current challenges and recent developments.

CIDAG 6th International Conference on Design and Graphic Arts

http://www.cidag.com.pt 20–22 October 2021



Held online, the sixth edition of this biannual

event features a three-day programme with four keynote speakers, a roundtable discussion and presentations that are this time dedicated to sustainable and green design, employing the appropriate methods, materials and printing processes.

Print Next 2021

Stockholm, Sweden 28 October 2021



The third edition of this Nordic event is organised by the network Grafkom, the Swedish Printing Federation (Grafiska Företagen) and the Nordic Offset Printing Association. The topics cover society changes after COVID-19 with impacts on marketing and advertising, business and economic issues, as well as approaches to increase sustainability and implement automation and robotisation.

WAN-IFRA Events



The World Association of News Publishers offers in the last months of this year both virtual and inperson events. After the second online edition of the World Printers Summit on 13-14 October 2021. the European Printers Summit takes place in Frankfurt, Germany, on 26-27 October and the Indian Printers Summit in Chennai, India, on 17-18 November. The 2021 editions of the World News Media Congress (29 November to 2 December), Print Innovation Awards (11 November) and Digital Media Awards Worldwide (2 December) are held virtually.

The online courses organised across the world include the WAN-IFRA Journalism Programme: Challenge of the Climate Crisis for the Asia Pacific and South Asia regions supported by Temasek Foundation (16 September to 28 October 2021) and two programmes for news publishing executives supported by the Facebook journalism project: the LATAM Newsroom & Business Transformation Program 2021 (from 2 September to 16 December) and the Digital News Innovation Programme – Subscription Bootcamp for India (from 1 October 2021 to 1 January 2022), which combine webinars and coaching sessions.

RadTech Europe 2021



https://www.radtech-europe.com 19–20 October 2021

The 2021 edition of this established conference and exhibition on radiation curing is held online. Participants can use the virtual platform also after the event to access recordings or continue conversations. In the two-day schedule, two tracks are reserved for technical presentations. Their topics on Tuesday include recyclable packaging options in the session focused on sustainability, an overview of current legislation together with its impact on curable acrylates and printing inks in the session on health, safety and environment, and progress in excimer curing and material properties tailoring, as well as the related studies, e.g. on double bond conversion, dose rate effects and dielectric performance, in two sessions reviewing application developments. The sessions on Wednesday are dedicated to advances in 3D printing utilising UV curing, the chemistry of photopolymerisation, raw materials, inks and graphic arts, diagnostic and measurement equipment, and radiation sources. In the third track, the first end-user session deals with various aspects of LED technology, including considerations for its implementation and process control, chemistry and future outlook, while the second one is focused on circular economy. In addition, the programme of the first day offers the fourth track with courses covering value chain, applications and end products, handling and storage of raw materials, radiation curing chemistry, formulation, ultraviolet lamps and light-emitting diodes, electron-beam technology, manufacturing equipment and conditions.

Book Conference 2021



Frankfurt, Germany 21 October 2021

Chapter 2 of the event Shaping the Future with Books, which is organised by Intergraf and supported by Smithers, takes place

at the Frankfurt Book Fair. The schedule offers talks discussing the book market trends, the regulatory framework for printing and publishing in the EU, omnichannel retail, changes in book production and production on demand, including the Gutenberg One book-making robot, the OECD's data on reading habits of 15-year-olds around the world, consumer behaviour perspective on printed and digital books, publishers' perspective, and environmental challenges in the book industry. Chapter 1 that took place as a webinar on 11 February 2021 is available for replay at the Intergraf website.

American Printing History Association's 46th Annual Conference

 IMPRESOS
 https://printinghistory.org

 Printing Across Latin American and Caribbean Cultures
 22–23 October 2021

This year's volume entitled 'Impresos: Printing Across Latin American and Caribbean Cultures' has a focus on the study of printing history and practices in said regions. It is hosted online through the Grolier Club of New York, America's oldest and largest society for bibliophiles and enthusiasts in the graphic arts. The conference programme begins with the panel exploring Latin America in print through four case studies, which analyse the production of the Pedro Craesbeeck press in Lisbon in the early 17th century, the Arco do Cego venture translating and publishing agro-industrial texts sponsored by the Portuguese government in the years around 1800, the first printing press in Trinidad and the circulation of Trinidadian seditious printings in Venezuela during the Age of the Atlantic Revolutions, and the networks and publishing strategies of activist printers in 19th-century Mexico (see also the related book of Corinna Zeltsman in the Bookshelf section). Keynotes are scheduled in the late afternoon of each day: 'Typefaces as Cultural Objects' by Juan Villanueva, presenting a collection of typefaces and letterforms illustrating Latin American visual landscape and identity on Friday, and 'La Impresora' by Nicole Cecilia Delgado, introducing the Puerto Rican poetry press and risograph print shop on Saturday. Other contributions deal with the history of local typefounding in Spanish America, digital collections of historical prints, bilingual writing in artists' books, and the work of selected printers and presses in this region.

European Graphic Arts Hackathon 2021

https://www.vigc.be 25–26 October 2021



This creative event is organised by VIGC – the Flemish Innovation Center for Graphic Communication, Ernst & Young, Intergraf and Sappi to facilitate team collaboration in developing highly targeted and innovative solutions addressing

the challenges in commercial printing, packaging, labels, marketing, industrial printing, and publishing. The time limit for teams of up to five people, assisted by experts and coaches, is set to 24 hours.

CIC29 - 29th Color and Imaging Conference

https://www.imaging.org 1–5 November 2021



For the second year in a row, also this event organised by IS&T, the Society for Imaging Science and Technology, is held online. Recordings from the event can be accessed also later, until at least 15 March 2022. Short courses take

place live in October. The new courses deal with the assessment of image quality and preference, colour science implications of modern display technologies, deep learning for colour applications, tools for digitising a motion picture film, a quantum-relativistic theory of the space of perceived colours and its applications to colorimetry, uniform colour spaces, and fundamentals of translucency perception. The courses on colour gamut mapping and colour imaging with compact camera optics are updated. The keynotes feature Andy Goris revealing some challenges in developing the sensor array for the HoloLens augmented-reality computer, Carol Payne, Matthias Schaftenberg and Nick Shaw presenting a scene-referred gamut compression in the Academy Color Encoding System (ACES), an open-source colour management framework, and Jean-François Lalonde showing approaches to estimate lighting from a single image and achieve photo-realistic results when combining virtual and real visual elements. The technical sessions include lectures on colour printing on pre-coloured textiles, the threshold of colour inconstancy, chromatic contrast sensitivity modelling, spectral-reflectance estimation under multiple light sources, and many more. In addition, three workshops are scheduled during the conference week.

Smithers Events for Printing and Packaging



At the end of this year, the events organised by Smithers are announced to be held either in the hybrid or in-person format. The latter include the 2021 editions of two conferences in the USA - SmartPack, the event covering progress in active and intelligent packaging, in Chicago, Illinois (1-2 November), and Specialty Papers in Milwaukee, Wisconsin (1–3 November), as well as two packaging conferences taking place in Europe - Sustainability in Packaging in Barcelona, Spain (2-4 November) and Digital Print for Packaging in Amsterdam, Netherlands (8-9 December).

39th CIP4 InterOp Meeting

Bruges, Belgium 15–19 November 2021

Focus topics of this meeting of CIP4 members, held for the first time since the COVID-19 pandemic has started and hosted by Dataline, are security issues in the cloud, JDF Integration Matrix and Conventional Printing ICS.

Digitalization in Packaging

https://www.aipia.info 16 November 2021



This congress held online by the Active & Intelligent

Packaging Industry Association is focused on smart packaging solutions for digitalisation, supply chain and sustainability. The topics covered by presentations running in two or three tracks and complemented with online discussions include, among others, smart engraving used instead of printing to reduce ink consumption, printed active labels for the quality control of the packaged food to minimise its waste, and innovative item-level digital identities utilising digital watermarking technology and advanced inkjet printing.

The Holography Conference

https://holographyconference.com 17–18 November 2021

This global conference, held as an online event for the second time, offers talks on product authentication through hologram validation using computer-vision mobile technology, methods to create depth within holographic space, and more.

Warsaw Pack

Warsaw, Poland 23–25 November 2021

This fair showcases packaging techniques, packaging, labels, labelling and printing,

automation, e-commerce, logistics, and storage. On the first day, visitors and exhibitors can attend the first edition of the Trends and Innovations in Packaging conference for free.

Labelexpo Asia 2021

Shanghai, China 7–10 December 2021

This event for the label and package printing



industry in the Asian-Pacific region is part of the Labelexpo Global Series held by the Tarsus Group together with the Labels & Labeling magazine.

Gulf Print & Pack 2021

Dubai, UAE 14–16 December 2021

This trade show for the Middle East and North Africa is also held



by the Tarsus Group. The topics of expert sessions offered for free during all three days cover automation and workflow, continuous improvement and lean manufacturing, product diversification, and more.

Paper & Beyond 2021

https://www.paperandbeyond.eu 17–18 November 2021



After the successful virtual edition held for the first time a year ago, this annual event organised by the Confederation of European Paper Industries can be joined online also in 2021. The announced topics cover paper recycling

and circularity, identified pathways to carbon neutrality, strategies for the more sustainable production and its financing, jobs in the paper industry, the new European forest strategy, the role of wood fibres in textiles of the future, and more. In addition, presentations by Blue Sky Young Researchers & Innovation Awards laureates are scheduled for the second day.

Industrial Print Integration Conference 2021



Düsseldorf, Germany 23–24 November 2021

This is the new event of ESMA, the European Specialist Printing Manufacturers Association. With a proven format comprising the two-day two-track conference complemented with a tabletop exhibition, the event aims to introduce new manufacturing possibilities using the screen, inkjet and other printing processes to industry partners and facilitate knowledge transfer. Besides the technological topics, which include advanced industrial printing, industrial print precision, modular print components, industry 4.0 integration, high-level automation, and integration with robotics, the conference covers also optimisation of energy consumption, reduction of emissions and waste, and sustainable alternatives to non-print processes among the environmental topics, as well as the business-related concepts, such as on-demand and low-cost production, customisation, personalisation, near-shoring and future business models.

The 2021 programme features the keynotes 'Printed electronics: Enabling the next generation of digital solutions' by Stijn Gillessen and 'Perovskite solar cells and modules upscaling towards industrialisation via meniscus coating techniques' by Yinghuan Kuang, with two more yet to be announced. Other presentations discuss the role of printing technologies, especially inkjet, in waste reduction in the production of electronic devices, upscaling challenges, such as realistic targets for jetting functional fluids in production, software compensation of print defects, inkjet printing integration using artificial intelligence, technology developments - from printing materials, ink formulation, surface pretreatment and ink degassing, to imaging, printing, UV LED curing and NIR drying equipment, up to combining printing and other production processes into hybrid machines and lines, emerging applications enabled by printed electronics, the direct-to-shape printing enabling both visual and haptic decoration, inks and processes to produce customised water-slide decals, case studies showing approaches to inkjet printing applications in the packaging and decoration industries, and more.

In addition, a special session is scheduled for 24 November with eight presentations discussing the experiences and functional prototypes resulting from the Paperonics project, joined in the past three years by 40 partners to explore the possibilities of efficient, affordable and sustainable printing of electronic components directly on paper and plastics substrates.



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3-2021

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