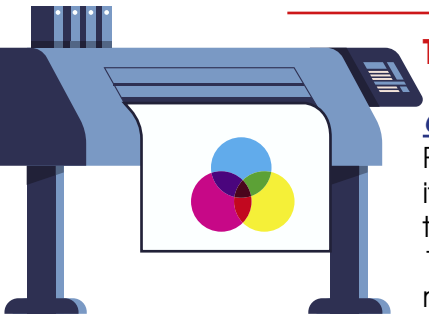
Before I begin this letter, I would like to thank the Intergraf Association for the opportunity it offers us each year in its Intergraf's Young Talent contest. I would also like to briefly introduce myself before presenting my ideas.

My name is Cédric Dumont, I am 24 years old, and I am an apprentice in the engineering cycle at Grenoble INP-Pagora. This engineering school brings together students from scientific fields and preparatory classes, but also people like me, from the professional sector. All my training is based on one major theme: printed communication. The 3 diplomas I obtained, the one I am currently obtaining and the 4 companies in which I worked have fully convinced me of the future of this sector. All these years spent in the world of graphic industries made me discover an atypical, enriching and forward-looking universe. A future in which innovations and major advances will have to make a place in the middle of techniques and environments anchored for many years. I am now going to present you my ideas, answering the two questions asked in the context of the Intergraf's 2021 Young Talent Award competition. I wish you a good reading.

The first question asked by Intergraf was: How will print grow in the future? My ideas are organized around four main themes: printing itself, application to the medical sector, the environment and finally printed electronics. Within these four themes there are various sub-sections, presenting my vision.



The print shop of the future!

On-demand printing : inkjet takes over !

First of all, as previously mentioned, printing itself will have to evolve and adapt. Since its origins, many printing methods have been used: from the simple stencil used thousands of years ago, to the new printing technologies emerging every year. In 1445, Gutenberg revolutionized the world of printing and invented the printing press, making it possible to reproduce documents in large quantities for mass distribution. The second great date to remember is 1993, and the invention of the Indigo digital press, making it possible to personalize printed matter through print-on-demand.

Today, the age offers multiple printing possibilities to everyone. We all have new desires emerging, and wish to be able to satisfy these new desires. New writers, wishing to publish their novels in very few copies; photographers, wishing to exhibit their works, and print them in single copy; a few dozen photos for a family album. All these examples are only a tiny sample among many requests.

The emergence of this kind of request will greatly modify the characteristics of the current printing machines. Programmed to meet high volume demands, they will have to be adapted to allow the printer to be profitable, while offering the possibility to run at a lower rate. The modification of high volume machines (offset, flexography), by offering the personalization of the printed matter thanks to the addition of one or more ink jet units are a possibility to be considered.

Moreover, the growth and development of the inkjet process could allow printers a certain versatility: a high rate of production, with the possibility of personalizing each print. The speeds of rotation will be certainly less high, but will be however higher than that of the current process, while preserving its strong point: the personalization. If we had to summarize: the future of printing rests in part on the development of the inkjet process. The possibilities, the profitability and the performances which this process offers are multiple, and could soon surpass those of the ancestral processes of printing...

Luxury for all !

A second axis of development of the printing industry concerns luxury, and especially the high added value to the printed product. Nowadays, the visual aspect counts as much, if not more than the functional aspect of the product. It is no longer enough to produce in a simple way, without worrying about the impact of the product. When a few years ago, a cosmetic packaging stood out thanks to the reputation of its manufacturer, or the shape of its product, it is considered old-fashioned today, if it does not display elements that can make it stand out in the eyes of the consumer.

The addition of finishing elements on a product, especially in the packaging and luxury sector, is now a necessity for every manufacturer. The multiple possibilities offered by today's machines make it possible to attract and charm consumers who are always looking for new attractions. Gilding, visual or tactile aspects, scented ink, are only a few examples of elements that allow to stand out.

This is one of the reasons that allows us to affirm with quasi-certainty that printing machines will have to be equipped with units to embellish the products. A simple product will not be able to stand out if it does not have

an innovative element. The need to promote one's product with high added value elements is not only on the manufacturer's side. The printer, by offering these additions, stands out from his competitors and creates a race for innovation that the printing industry will engage in. And competition leads to performance: this innovation race will allow new finishing methods to emerge, and make each product unique, by its visual, tactile, or even olfactory aspect.

Production flexibility & printing

Finally, one of the important points on which the printing of the future will have to lean is the support. Indeed, for a few years, many so-called «rigid» supports are replaced by more flexible supports. And for good reason! We are now looking for a product that can adapt to any material, any place and any support.

Moreover, the majority of the machines of impression are programmed to be able to turn on any types of supports, of any thickness, and of any matter. The adaptation of the machines for flexible supports will thus not be of the most expensive, and will offer to the consumers a possibility of widened arrangement of the product.

The flexibility of this type of media, as well as its versatility, allows suppliers and customers to consider multiple functions for products. One of the simplest examples is printed circuit boards: currently printed on rigid media, they are not adaptable everywhere. By developing the printing of printed circuit boards on flexible media, they can be placed anywhere, and in a simple way. Moreover, a significant aspect of the support concerns its end of life. Flexible media are processed in a faster, cheaper and less complicated way. This aspect can no longer be neglected in today's industry.

Printing to heal !

Prevention is better than cure

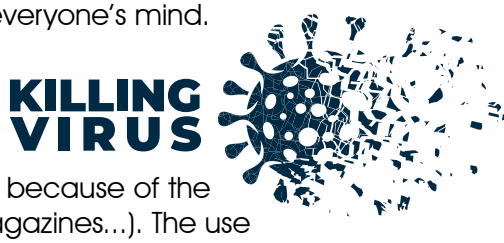
The second major shift in printing is towards a completely different field: medical. The current situation proves to us how much this field can change our lives and our habits. It is no longer possible to leave this aspect aside, and it seems essential for all industries to think about this subject.

First of all, it is necessary to know that every year the REACH (Registration, Evaluation, Authorization and restriction of Chemicals) reclassifies dozens of substances and components as harmful for the environment, but also and especially for the Human. These substances are both directly harmful (irritation, burns), but also indirectly (long-term illness). The need to study the materials in a more thorough way must become paramount. It is no longer conceivable to expose oneself to such risks when using these products.

In the year 2019, a great revolution in the printing industry took place: dozens of photo initiators were reclassified by the organization as «harmful to humans». From that moment on, all ink suppliers had to rethink the formulation of their inks in order to make them «usable». It is no longer possible to do this. The curative treatment must become a preventive treatment, and no longer endanger the health of the users.

Moreover, the use of non-harmful and «acceptable» substances by humans can open new horizons for the printing industry. Indeed, the historical fields of application must evolve and turn towards the major stakes. Medical applications are one of them. Working for a safe and secure use must be on everyone's mind.

Virucidal properties



One of the most important issues that printers will have to address is the printed materials themselves. Today, we are experiencing the largest virus-related pandemic in the world. The use of many products is made impossible because of the strong propagation of the virus on the various printed supports (flyer, books, magazines...). The use of inks with virucidal or bactericidal properties is a bright solution to revive the use of «physical» media.

The transmission of viruses is largely favored by the passage of objects of all kinds from hand to hand. If today, the advertising supports, the books, even the banknotes receive a coating, or are printed thanks to inks allowing the destruction of the viruses and bacteria, the transmission will be only reduced, even stopped.

The involvement of printers in each industry, each sector of activity is possible and sometimes indispensable. Here, we cannot define this involvement as indispensable, but it can nevertheless play a very important role with regard to the health of everyone.

A body that works

Finally, the last medical aspect on which printing can have an influence, is none other than the powering of medical systems. The development of innovative technologies allowing the supply of medical systems (pacemaker, mechanical organs) cannot be done in an inappropriate way. We now know that some inks allow current conduction. We also know that some inks allow the manufacture of batteries, or batteries allowing the supply of electrical systems. However, we also know that these inks are not compatible with the human body, because of their formulation. The micro or nanoparticles of metals are indeed harmful to humans, when they are in contact with the human body. This is why any printer who wants to integrate this field of activity, will have to develop, and to be directed towards inks and supports «compatible» with our body. A new start-up company has just developed a system combining paper and enzymes allowing the supply of electrical systems, and being perfectly compatible with the human body.

These so-called compatible materials can be used in various ways. As said before, they can play an important role in the making of power systems. But they can also have properties to detect certain viruses, certain diseases. We can easily imagine a reactive ink in contact with certain molecules, allowing with certainty to unseal a virus present in our body. This is the challenge of developing materials, and mainly inks that are not harmful to our bodies.

Our beautiful planet

Finally, the last point on which the printing will have to lean is none other than the environment. Our planet is full of resources, but is running out of steam. And for good reason! Every year, resources are depleted, climatic conditions deteriorate, and inequalities worsen. The only one responsible for all these actions is Man, who can still act for the conservation of our habitat.

As previously discussed for Man, the use of materials harmful to the environment must be reduced. Indeed, today, too many harmful materials are used in the printing industry. Inks, substrates, machines, and others contribute to the degradation of environmental conditions.

The extraction of metals, the manufacture of certain materials and the export of products result in various emissions of gases that contribute to global warming. If the metals can be replaced, then the gas emissions due to extraction will be reduced. If the manufacturing of certain materials, media or machines is done in an environmentally friendly way, the emissions will be reduced. If the export industry abandons airplanes and prioritizes «greener» means of transportation, the environment will be better. All these evolutions seem simple, but too many of them are not yet privileged by the printers.

Finally, the last aspect of this part concerns the waste and the use of non-essential materials in the printing world. The famous backing material, on which adhesive labels spend only a small part of their life, represents a large majority of «non-essential materials». Mostly made of plastics, their use could tend to disappear.

Representing more than 50% of the waste in the printing industry, this kind of material must be separated from the label, processed by a third company, then recycled by yet another company. This recycling chain incurs many costs, both for the company and for the planet. The emissions linked to the separation of materials, to the different transports, as well as to the treatment of this one are enormous. One of the solutions would be to simply eliminate this type of material.

One of the most admirable examples of how to do this is to use labels without underlays. These labels have a similar structure to any adhesive label. However, the added bonus is the addition of a «release» material, which allows the labels to be superimposed on each other and allows the labels to be separated without difficulty. The suppression of this kind of «support» material would allow a clear reduction of harmful gas emissions, and an increasing respect of the environment.

Let's develop printing!

The last point of this section deals with a current topic, which has been attracting the attention of all players in the industry for a few years now: printed electronics. As said before in this part, the non-functional printed product is not enough anymore. It is necessary to add functionalities, additions and sometimes even assets that allow it to stand out from the others.

To do this, printed electronics is THE revolution in printing. Today, the majority of products are produced on a laboratory scale, but the turn towards industrialization must be part of each company's strategy. The race for innovation in this field is raging, and the inclusion of conductive, insulating or transmitting components in products will put printing back on the map. This focus will move the industry from «outdated» to «innovative and forward-looking». The inclusion of electronic technology in products will have to be done the easy way: a smooth transition, evaluating all the issues and turning points it will entail.

The challenge is to diversify from competitors but not only! The innovation that printing will bring to the fore will make the sector even more indispensable than it is. On the other hand, this transition should not be made without thinking about the consequences of such changes: environmental, financial and organizational. Everything will have to be studied to allow the company to innovate in safety, and to make again, leap the printing industry in a new world.

Because of all these opportunities, the printing industry still has beautiful hours ahead of it. On the other hand, it is necessary that this beautiful world adapts, and turns to a different time of those former. It is however certain that these adaptations are with the range of each one, and that these evolutions will only make evolve a sector in perpetual search of innovation.

The second question asked by Intergraf was about the work environment we were looking for, and how a printing company could provide it. In order to answer this question as precisely as possible, I will address various themes: the values necessary for a good working environment, the period we are in, and finally the balance between preserving authenticity and innovation.

A world of values

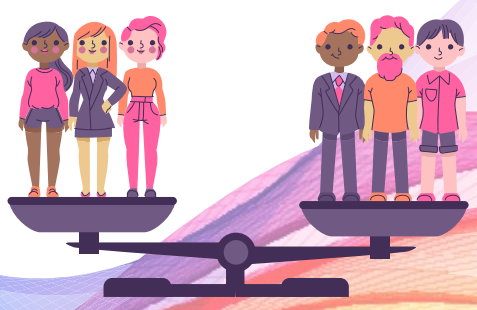
Personal values

The printing industry, a vast world in perpetual development, never ceases to innovate, evolve and break the codes. The evolutions do not only affect the means of production, but the entire chain: logistics, production, environmental values... Each theme is constantly diversifying and evolving. Production must adapt to all these constraints. Respectful of the environment, not too expensive, easy to supply, it is necessary to turn to a «local» production, not jeopardizing the activity with possible stock shortage.

Moreover, a local supply makes it possible to mitigate possible restrictions of free circulation of the products. In France, in 2020, the sanitary crisis led to a shortage of flour. This cereal being imported from European border countries, the price increase has led many manufacturers to increase their prices, which has resulted in general discontent. It is quite possible to imagine the same scenario concerning inks, papers, or other consumables (especially when we know that the main suppliers are spread all over the world!). A local supply, allows to mitigate any shortage, and thus an increase of the prices.

Also, local sourcing will allow for reductions in the company's carbon footprint. Respect for the environment is also a primary value in my opinion. The transportation of materials represents more than 30% of a company's greenhouse gas emissions. Whether by plane, truck or car, the further away the supply is, the bigger the company's carbon footprint. The environmental issue must be at the center of all attentions. We are lucky to have a multitude of riches on our planet, it is necessary to preserve them by our actions.

Even today, too many actions do not take into account the environment. Use of non-degradable materials, waste of all kinds or even waste sorting not respected are all reasons to think that the environment must occupy a more important place in everyone's mind. In recent years, the emergence of new so-called «green» products has allowed industry players to improve their environmental responsibility. One of the most striking examples is the Graspaper. Composed essentially of grass, produced a few kilometers from the paper mill, this paper has properties similar to any other paper, while offering a much better eco-design. Biodegradable, close to the factory, the carbon footprint released by the production of this type of product remains very low, and allows first of all a better respect of the environment, but also and especially, a very clearly improved brand image.



Multiculturality!

Finally, the last point of this part concerns an aspect of the profession that is not mentioned enough. The world of printing remains a very closed world culturally. Few are the women who make their way in the middle of all these men.

Too many are the old and historical minds, compared to the innovative and innovative minds. The diversities in this sector do not allow a total opening, and a progress in accordance with our time to the printing sector.

Cultural diversity should not only be a political or personal issue, but also a professional issue. One of the most common topics in companies is gender equality. Very often made up of male and female operators, the sector tends to be difficult to open up to this parity. Ideally, the workforce would be composed of as many women as men, which would allow for an easier integration of a larger number of people. It is sometimes difficult to integrate into a company composed essentially of men when you are a woman, and vice versa. A company composed of equal parts of men and women, would allow an easier integration, and a calmer climate to all newcomers.

But the question of parity does not only concern men and women. It also concerns all the public, different by their religious, political or ethnic conviction. Open-mindedness and major advances have never been possible without diversity, and even today, it is necessary for a printing house to offer this diversity.

The world 2.0*

The printing 2.0 !

In the following part, I would like to talk about a theme that can no longer be left aside: the evolution of printing, in accordance with the evolution of the current world, while remaining authentic. Because yes, printing remains an ancestral domain, which must not forget its values and origins, but which must also know how to adapt to remain attractive.

Today, it is obvious that the world has evolved considerably. The old, very down-to-earth generations have given way to the new, all-connected generation. Innovations specific to this generation are constantly flourishing. Social networks, virtual and augmented reality, functional and connected print have become some of the industry's must-haves. On the other hand, it is necessary to remember that printing remains a noble and ancestral profession, whose purpose is to distribute information.

Also, the need to offer diversity in terms of production must arouse the interest of printers. The reactivity of a company allows it to strongly improve its brand image. Today, the diversity offered by the new types of inks, consumables as well as supports allows an offer at the height of the customer demand.

The last point that I would like to approach in this part, concerns the functional and structural impressions. Indeed, a printing company in accordance with the innovative advances strongly favors the feeling of its employees: optimism, usefulness or well being are as many feelings that an employee of an innovative company will feel. For some years now, printed electronics has been a sector that has been developing little by little. The forecasts concerning this market are excellent, and the growth seems important. On its side, 3D printing is gaining ground. The possibilities of creation are multiple, as well as the materials used.

When we talk about these two sectors, it is difficult not to make a connection and to envisage products combining these two technologies. The design of objects in 3D printing, with added value thanks to printed electronics, would make it possible to offer connected objects, for large volumes. What differentiates this future manufacturing process from the current one, is its simplicity and cost, which will be equal or even better than the current ones.

Moreover, this kind of technology will allow the company to work autonomously, and thus not to be dependent on others. An autonomous company will reduce its delays (less waiting when a part is needed), as well as its costs (internal manufacturing) and its environmental footprint (less transportation related to supply). The autonomy of a company is therefore a point on which the need to focus is increasingly great for the good development of its environment.

To conclude on this issue, I think it is very important to have a work environment that is specific to one's convictions and values. The company must be able to adapt to the demands and changes of the world, while allowing its employees to recognize themselves in it. As far as I am concerned, I think that each point mentioned is important : the environment, innovation, authenticity, cultural openness or the satisfaction of all are all points on which a company must focus in order to offer an adapted and satisfying environment to all.

This presentation is over. I hope to have attracted your attention with my ideas and suggestions. Once again I would like to thank Intergraf and all the actors allowing us, young people and future actors of this world to express ourselves and to share our ideas.

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