



Discover the Value-Adding Process of Digital Surface Decoration

A COLORGATE WHITEPAPER

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INTRODUCTION: The Value-Add of Surface Decoration

The decoration of surfaces is a critical step in many industrial production processes. In business sectors where buying decisions are made based on an item's décor, the value-add of this process step is extraordinarily high.

The print and color quality of the décor has a direct influence on the price that can be achieved for the end product.

A blank, standard quality t-shirt can be purchased for about 1,50 Euros when ordered in bulk. When decorated with a clever design, it will retail in online shops for about 20 Euros, in high street retail much more. A raw tile ("bisque") is essentially a piece of pressed clay so its material value is about a few cents. Decorated tiles, however, retail for 20 – 150 Euros per square meter.

In surface decoration for furniture production, margins are more difficult to quantify as in this B2B business, prices are not always transparent and there is no "undecorated" product that can be compared to the decorated one. However, the question of decoration has shaped the industry ever since and explains the relevance of décor papers, veneers, edge bands and other supplier products. The print and color quality of the décor has a direct influence on the price that can be achieved for the end product.

This is also true for haptics. A furniture surface is considered more valuable when it does not only look like wood but also feel like wood, and the more the look and the feel are "synchronized" with each other, the higher the value of the surface is.

On the following pages you will find a brief summary of the benefits and challenges of digital surface decoration, and how you can face them successfully.

CHAPTER 1:

Economics of Digital Décor Printing

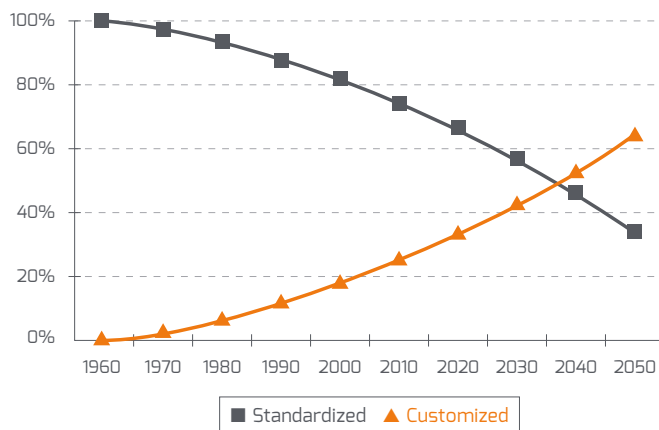
Translating the Margin Into the Bottom Line

How do you maximize revenue? Furniture producers are looking for “cool”, unique, creative product ideas that can go into production really quick. In many industries, we see a trend towards quick time-to-market for new products and customization options, and this is no different in the furniture industry. Producers need to be able to present customers a prototype quickly, and to process their feedback swiftly and in an interactive fashion.

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Some industries generate new business from mass customization offerings, where prints, garments or other objects can be totally designed by customers through online design tools. While a trend towards customization can also be observed in the décor and furniture industry, its products are special with regards to their longevity and the need for professional knowledge to come up with aesthetic designs for everyday use. Customization strategies typically aim at other levels, such as composition of furniture modules, the arrangement, accessories and the materials used.



Market share of standardized, mass produced versus customised products

Source:
https://www.researchgate.net/publication/245527246_Mass_Customization_of_Wood_Furniture_as_a_Competitive_Strategy

There are some online shops that are taking customization further already, you can find them by googling terms such as “furniture customization online”. This kind of B2C mass customization business with a minimum order quantity of one unit will continue to grow dynamically, yet from a small base. And in the B2B market we see from many décor producers, a dedicated digital offering that addresses a demand for special collections or regional designs for global markets. No matter how you look at it, the relevance of efficient short-run production is increasing.

Cost Reduction, Enabled by Digital Printing

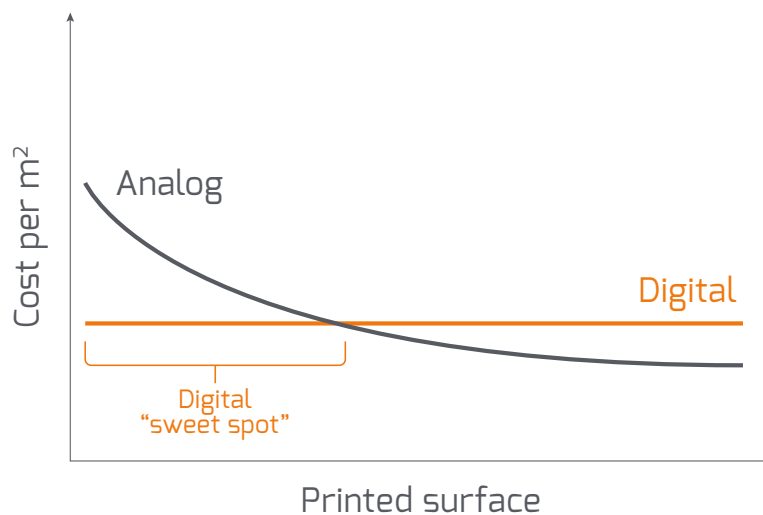
Workflow automation helps sharing the same job data between production teams.

The second obvious way of taking as much margin as possible into the bottom line is cost reduction. As a traditional craft and even art form, furniture production still has many manual steps and relies on individual talent and human judgement, for example in visual approval processes. That is why in many production sites there is potential for efficiency improvement. Workflow automation helps by sharing the same job data between production teams. Digital print data, as opposed to printing with cylinders or screens, can be corrected during the production process so small deviations can be fixed before they turn into large ones. Such techniques help minimizing complaints and returns. Also, many people are not aware that in digital printing, the amount of ink can be significantly reduced in many cases, offering cost and functional benefits such as reduced drying times. The concept for such ink reduction is based on GCR, “grey component replacement”, which makes use of the fact that in inkjet printing, composite colors can often be replaced by a single other color.

CHAPTER 2: How Digital Printing Enables Your Business

The Obvious Benefits of Digital Printing

Digital printing fits well with the new increasing requirement of producing short runs economically. The special cost structure of digital printing, and its advantage over analog printing, is almost commonplace. Analog printing requires the production of plates, screens or cylinders, causing significant cost before the first unit or square meter has even been printed. If you distribute this cost, together with all other setup cost, to a production batch in order to calculate the “cost per print” or cost per square meter, you will find that small to mid size production runs come with relatively high cost per print.



In this segment of print jobs, digital printing is more competitive. However digital inks still have a price while screen or gravure printing ink cost “almost nothing” so with mid to long runs, analog production will have a cost advantage.

Also, décor designs usually arrive in a digital way, and a digital printing process can handle that much easier. Digital connects directly to digital, and you have no digital to analog conversion steps. If you don’t need to make a cylinder in between, you do not only save cost, but also lead time and stocking challenges. Every print can be different, and you gain a lot of speed and flexibility.

The (Not So Obvious) Challenges of Digital Printing

However, there are also some challenges in digital print, and they are not always obvious. Some décor producers needed to learn this the hard way, and it is good to be aware of these challenges before starting a digital printing project.

The surface decoration industry has an extremely high quality standard. Surfaces, edge bands, different pieces of furniture, repeat productions — this all needs to be in visual match. The acceptable tolerances in this industry are way smaller than in other inkjet applications such as textile or fine art printing. This means that the traditional color management methods such as ICC-based color profiling, are not sufficient. Also, these methods assume that you capture the characteristics of your printing setup once, before the production run. If color drifts occur during the production, classic ICC color management has no way to react to that.

Consistency is highly important.

Consistency is highly important, and we do not only mean the consistency of prints from one machine. Consistency means to be able to produce the same result — within those narrow tolerances — in different production stages. This can be described by our “3x P2P formula”:

- Print to print: consistency of the same printing system, during one print run or between different runs of the same job
- Printer to printer: consistency between different printing systems or technologies, for example between proofing and production systems, or between production systems from different brands
- Plant to plant: consistency between different production locations, and ideally this is achieved without sending physical samples back & forth

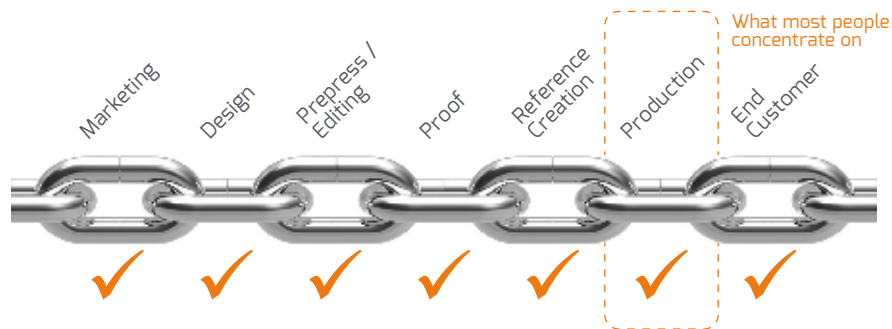
And lastly, where do you get the know-how from? “Color management” is not a trade profession with defined educations and institutions. Building and hiring color management know-how can be scary, and you might want to rely on an external source from which you can obtain this know-how on demand.

An obvious piece of knowledge, not always obvious to analog printers, is the fact that color corrections are not done at the machine or by tweaking color curves. Workflow and settings between print data and print result must be standardized and kept identical at all times. A change that happens to color reproduction can be managed or compensated as long as it is stable. If the change is erratic, it is a moving target and cannot be managed at all. Hence in digital printing, after linearization and characterization, if the result is not as expected, it is the print data that must be changed, not the characteristics of the output system.

Color Management Chain & Global Consistency

Digital printing and color management affect all departments' work. Relevant color decisions are being made in all steps of the value chain and not only, as is often believed, in print production.

- At the start, marketing defines products and services and how they will be rendered to the customer. If proper color management exists, the marketing stage already will create a realistic customer expectation.
- Design can better specify and predict or proof the final outcome to be expected.
- Prepress works better and faster under defined standards, and most processes can be automated.



In order for a color workflow to be intact, all departments need to work together cohesively.

- Clear guidance for proofing and reference creation takes the guesswork out of color judging.
- Production, similar to prepress, knows what needs to be done, and has software parameters and device settings correct to get the most out of the production devices.
- The buyer receives a product that matches the original expectation.

In order for a color workflow to be intact, all departments need to work together cohesively.

In Summary: Software **Enables**, **Empowers** and **Objectivizes**

Software **enables** digital production, as hardware alone is not able to produce sellable quality, at least not over time. Different substrates, production batches of ink, changes in hall climate, color drifts and more will need to be corrected all the time. Or, to put it short, the power that the hardware provides needs to be controlled by software.

With its connectivity to workflows, be it online shop systems, other forms of e-Commerce workflows, Print MIS systems and others, software **empowers** unique, customized, creative products with a lot of potential for automation and a faster time to market.

Software also **objectivizes** QA processes. Based on today's sophisticated measuring technologies, color differences can be reliably recognized without relying on personal skills or somebody's form of the day. The early recognition of quality problems avoids scrap and rejects and leads to transparent, predictable cost.

CHAPTER 3: Why Software Solutions from ColorGATE?

ColorGATE is a globally leading vendor of software, services and tools for color-critical printing applications.

In 2010, the company was already heading towards industrial printing applications, including dedicated solutions for surface decoration. Over the years, ColorGATE has developed specific technologies that ensure that the demanding quality standards of the furniture and flooring industry can be achieved. The company has staffed its organization with application experts, be it in management, professional services or product management. This ensures that customers from furniture or décor production can discuss their digital printing challenges with ColorGATE on an expert level and trust that value-generating solutions can be found in an efficient and professional way.

In the 25 years of its existence, ColorGATE has 19,000 instances of its software solutions installed in the field. The company has also developed 1,900 device-specific drivers that allow users to max out the potential of their digital printing hardware investment. Over 70 hardware manufacturers have partnered with ColorGATE in the mutual development and selling of software.



ColorGATE Technologies for Surface Decoration

The basic component when designing a ColorGATE-based décor production workflow is Décor Productionserver. Its main functionality is to take a décor design file and to convert it into print data for the intended output system. The design file typically does not have the characteristics of the intended printing system in mind, it is usually device independent. Décor Productionserver converts the design file into the specific print data for the output devices specific resolution and color space. It can also make the output device print in accordance with a company-wide reference, so from proofing printers to the final production system, the entire company works with a realistic impression of the final end product. This also applies when production takes place in several, decentralized locations.

Based on ColorGATE's Inksaver technology, Productionserver can also save up to 20% of ink in digital production which leads not only to reduce ink costs but also to functional benefits like reduced drying times, reduced metamerism and reduced color shifts.

Décor Productionserver also offers several automation options. If you receive print jobs from workflow systems or Print MIS systems, you can streamline the handover to the production stage by various options. ColorGATE's first recommendation for workflow automation is Productionserver's built-in REST API, a powerful, bi-directional way of exchanging files and data. Its function and syntax should be familiar to most web developers. Other options supported by Productionserver is information exchange through XML/JDF-based job tickets and lastly hotfolders and naming conventions.

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Fingerprint Module

ColorGATE' Fingerprint Technology has everything on board required to generate a “digital twin” of a physical reference: it contains the information to reproduce the sample (i. e., the printing data) as well as the information to check if the copy has been reproduced identical to the original (i. e. spectral color measurements of the reference). The color measurements are taken from a measuring chart that is created specifically to the selection of colors used in the design. That means if a décor design – like it is often the case – contains just different shades of the same color or similar colors, measurements are not wasted to cover areas of the color gamut that are not even included with the design. Instead, grid points from the measurements are concentrated in the area that is really needed to reproduce the highest possible quality. The Fingerprint technology is what enables consistent results between devices and different production locations, always keeping the narrow tolerances of the décor industry in mind.



Color Correction Loop Module

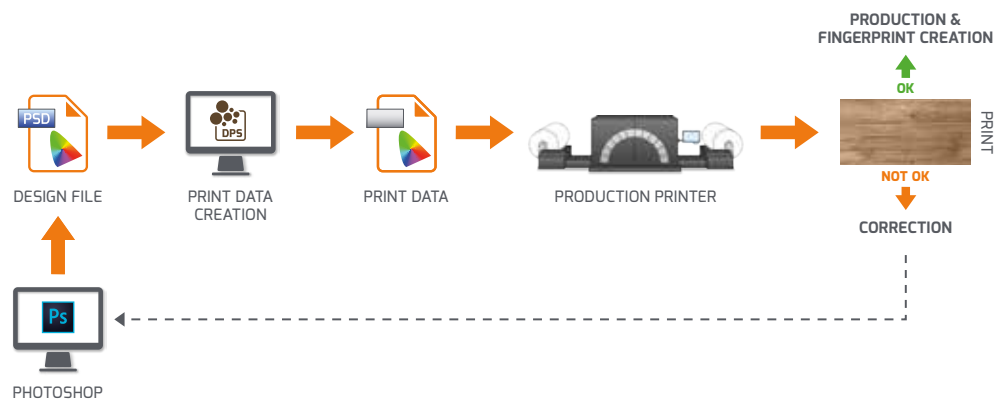
ColorGATE's Color Correction Loop Module detects and corrects color drifts and deviations “inline”, during the ongoing production run. For that purpose, the supported measuring system takes spectral measurements during the production run. ColorGATE's partner IPAC even has measuring systems available that can determine the print's similarity with the reference without creating additional control marks or targets. If a deviation is detected, the Color Correction Loop Module will trigger the calculation of a correction profile, and new, adjusted print data will be created. Depending on the integration with the printing system, the new print data can even be loaded into the system's print data buffer during the production run, creating a fully automated color correction workflow that corrects color deviations before they exceed a critical tolerance.

Digital Production Scenarios

In the following, we will show a few digital décor production scenarios that are used by ColorGATE customers.

FIRST RUN & APPROVAL

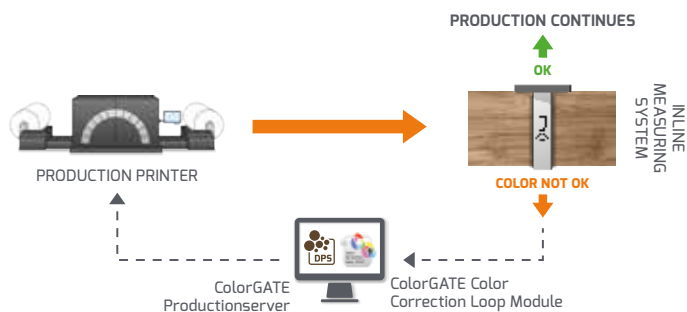
A décor design has been approved for production by the creative department. It is sent to the Décor Productionserver that has been set up with the correct linearization and MIM for the production system with its substrate, ink and print mode. This leads to a color-accurate production print. If the print result is not satisfactory, corrections need to be made to the print data, typically performed in Photoshop.



With simple workflows, ColorGATE's Décor Productionserver is a powerful and efficient tool.

RE-PRINTING / MONITORING / CORRECTION WITH THE COLOR CORRECTION LOOP MODULE

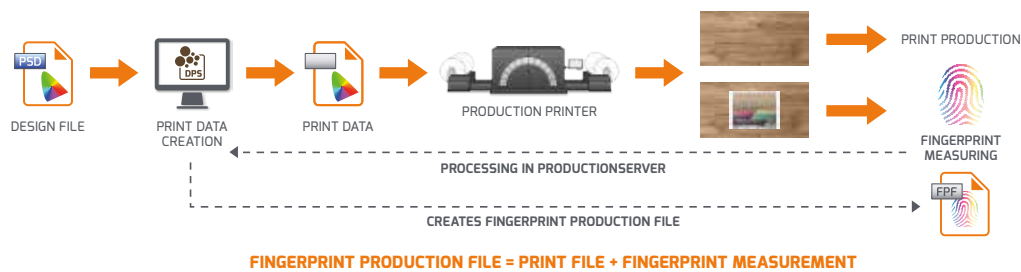
When the Color Correction Loop Module and Fingerprint Module are combined, Décor Productionserver becomes particularly powerful. The Fingerprint file as the digital reference contains both the print data and the spectral color reference data, and the Color Correction Loop Module can detect and correct color deviations inline as they occur during the production run. The highly automated, self-correcting décor production workflow is now complete.



FINGERPRINT CREATION

Once the décor design and print result is approved by the production stage, it is now considered the reference. Going forward, prints and re-runs are supposed to match this reference. For that purpose, a ColorGATE Fingerprint is created, a digital twin of the physical sample. Décor Productionserver creates, in addition to the actual print file, a measuring chart that is specific to the colors used in the design file. Once printed and cured, the Fingerprint has to be measured with a spectrophotometer. The measurement data is embedded in with the Fingerprint production file, which completes the creation of the digital twin. From now on, Décor Productionserver can reproduce this reference on various printing systems, without sending physical samples around the world. Further modules complement and support this workflow, for example the Out of Gamut Module that identifies differences between printing systems in terms of the color gamut that can be achieved.

A ColorGATE Fingerprint is the digital twin of a physical sample.



Let's Discuss Your Digital Production Needs!

As you have seen in this whitepaper, ColorGATE offers advanced software technology that helps you to create a value-creating, efficient, profitable digital surface decoration workflow. But we can offer you even more: measuring and digitization technology which provides high quality data needed for the sophisticated design digitization and color transformations, and our Professional Services team which can cover from pre-sales analysis, through to installation, configuration, training and monitoring — all your know-how requirements.

Reach out to us through this email address: contact@colorgate.com,
or through the website www.colorgate.com