

DIGITAL PRINT TRENDS AND TECHNOLOGIES IN THE SIGN AND GRAPHICS INDUSTRY



CRAIG M. BERGER



INTRODUCTION

Managing large format digital printing is considered among the key tasks for sign fabricators in order to be successful today.

Digital printing is a key part of nearly every area of the sign and graphics industry. Lack of planning can cost thousands of dollars and hours while successful print management can create new innovations and foster new opportunities.

This paper provides an overview of the technologies, methodologies and materials shaping the way designers, fabricators and manufacturers are navigating digital printing processes.

Key trends include:

Fabricator in-house investment in large format digital print processes or utilizing outside specialists.

Identifying the correct process for quality, durability and changeability for different interior and exterior applications.

Opportunities where graphic applications can enhance or replace paint or natural materials and coatings.

Ways that large format digital print solutions can work with architectural environments.

This analysis incorporates the viewpoints of key industry influencers including material manufacturers, fabricators of unique and scalable solutions, printing specialists, and architects and designers. The paper will share their perceptions on the direction of digital printing including opportunities and challenges that have risen when applying different approaches. These will be combined with examples of applications where graphics have been integrated with signs in settings including retail, transportation, healthcare and corporate campuses.

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Mr. Davis manages a small architectural fabrication company specializing in durable exterior and interior custom sign and placemaking projects.

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**President
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Ms. Gillispie's company specializes in innovative approaches to interior and ADA signs using a variety of printing approaches and custom architectural interior and exterior fabrication projects.

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Mr. Jones is a specialist in a variety of printing processes for large sign and graphic rollouts.

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Mr. Lee has focused his business on experimentation in direct to substrate printing.

**STEVEN OLKEN
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Mr. Olken manages large printing accounts for retailers and institutions. He is a specialist in educating end users on leading print approaches in the environment.

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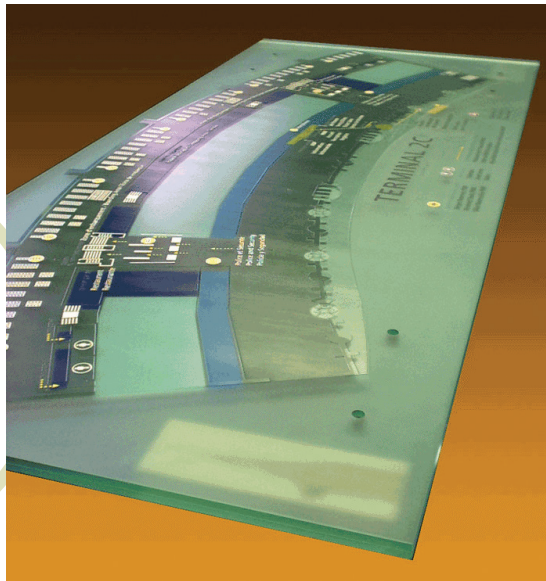
Mr. Stockdale is a specialist in porcelain enamel graphics as well as other print methodologies that interact with porcelain.

In addition **10 other designers, fabricators, and material consultants** agreed to speak off the record for this report, providing additional background information. We appreciate their contributions which have been crucial to the success of the report.

DIRECT TO SUBSTRATE AND LAYERED PRINTING

SCREEN PRINTING

Digital direct to substrate and layered printing grew out of a much older technology—screen printing, where ink is applied through a fine mesh onto a variety of materials including fabric, wood and steel. In its 1000-plus-year history, an entire industry of craftsmen, schools and suppliers have grown to service screen printing. In some industries that require large scale manufacturing processes like product packaging, screen printing still plays a leading role. Even though screen printing is being replaced by digital technologies in a variety of areas, the process still plays a large role in the sign and graphics industry. This is particularly true for projects that demand a large rollout of similar signs in a narrow color range like parking, informational and brand signs. Screen printing in the right hands is still renowned for its crisp lines and ability to work on a variety of surfaces, but requires a large investment in training and facilities.



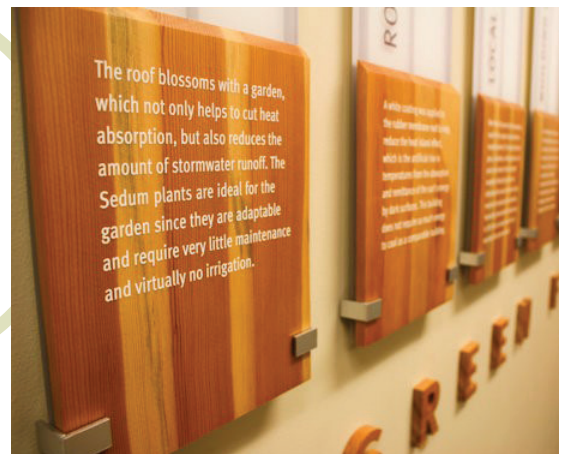
Screen printing still plays an extensive role in surface printing with incredibly sharp effects, particularly with a limited color palette and repetitive work.

DIGITAL FLATBED DIRECT TO SURFACE PRINTING

The technology for inkjet printing has been known for more than 100 years but it was not until the 1970s when companies were able to develop practical inkjet printers for commercial use. Inkjet printing became hugely popular in the 1990s as a low cost approach to color printing, but it took another two decades of continuous improvement before ink printing achieved levels of crispness close to that of screen and photographic approaches. Flatbed printing added another technology innovation, creating the ability to print on multiple substrates that did not need pre-preparation for size or shape beyond the parameters of the overall size of the bed.

Many large flatbed printing beds have the capacity for up to 2-inch thick materials and sign companies have grown adept at printing on a wide variety of surfaces from different grained woods to textured metals. This has made the process as much of an art as a science with companies experimenting with special visual effects.

Flatbed printers can print on different materials and very thick surfaces but every material is different and requires a different ink alchemy.



DIRECT TO SUBSTRATE AND LAYERED PRINTING

SOLVENT AND UV CURABLE INKS

Flatbed printing utilizes two primary ink applications: Solvent inks, which are generally waterproof and durable for outdoor use, but require extensive heating of the ink and material during the printing process; and UV inks, which are cured when exposed to sunlight. UV inks are more environmentally friendly but are susceptible to cracking (which flatbed printers minimize) and are less durable. There are many formulations of solvent and UV inks that are effective for different substrates and environments and frequent advancement has made UV inks effective for outdoor applications.

DIRECT TO VACUUM FORMED PLASTIC

Vacuum forming graphics has been in practice for sign faces for at least 40 years, but not until recently have software and hardware been developed to successfully print to these surfaces. This includes software that can control for the distortions that occur when the plastic is molded into a dimensional shape allowing for perfectly printed dimensional graphics.

PRINTING AND CUTTING

Like with vacuum forming, new innovations have been successful at combining traditional technologies into newer approaches. The integration of flatbed printing and routing technologies, have turned the creation of printed signs into a seamless, efficient process. This technology has been developed primarily for the packaging industry, producing the advanced packaging fixtures being utilized in supermarkets and department stores.



Flatbed printing on Coroplast is rapidly becoming the material of choice for promotions, events and other exterior brand applications.



Printers that can both print and cut, streamline the production process for fixtures. They may precipitate a merger between packaging and fixture development.

“ROUGH” DIRECT TO SUBSTRATE PRINTING

Different printing companies use different terms to describe this process including Spatial Prints™. This is the ability to print on a limitless variety of loose substrate surfaces including cork, sand and rusted steel. This approach adds another dimension to where graphics can be applied in art, display or industrial settings.



Direct to substrate printing can be applied to loose materials like bottle caps or strands of spaghetti.

3D PRINTERS

3D printing is still very new but has seen some potential in the sign industry, particularly for ADA signs and complex interior dimensional signs. Because these printers can create a sculptural object and apply print graphics, they can create customized solutions. Extensive speed and durability issues must be resolved. There has been one major success in the use of digital printing for signs, and that is for creating very exact cast molds based on intricate sculptural forms. A number of new and existing companies are moving to take advantage of this specialized market.



The ability to create intricate objects and add color has enormous future potential for custom signs.

ATTRIBUTES OF DIRECT TO SUBSTRATE AND LAYERED PRINTING

Can be applied to dimensional surfaces.

Can be applied to a variety of rigid and semi-rigid materials including metal, aluminum, wood and plastic.

Rapid advances in ink and printers have improved durability creating the potential for outdoor use.

New machines can combine and automate a number of printing and cutting tasks for sign and fixture development.

DIRECT TO VINYL AND FABRIC PRINTING

Over the last 30 years, the printing of large format graphics on vinyl and fabric has brought together a complex ecosystem of fabricators, print companies, ink and material manufacturers. This community has lowered the barriers to digitally printed signs and has allowed even the smallest fabricators to enter the market. At the same time, the role of vinyl and fabric has changed from the primary material for sign development—a role now filled by direct to substrate printing. Vinyl and fabric printing finds itself as a medium for covering large exterior and interior wall and window surfaces.

PRINTING TO ADHESIVE VINYL

The standard in the industry for many years has been the use of white adhesive vinyl that can serve as a base surface applied to multiple materials. This part of the market has grown quickly with the growth of glass façades in retail applications. Sign fabricators have begun to implement large graphic surfaces as a replacement for traditional sign installations.

Printed graphics are becoming essential to graphic identity programs.



Translucent vinyl provides strong day/night effects for printed graphics.

PRINTING TO MIRRORED, TRANSPARENT, MESH AND TRANSLUCENT VINYL

Internal illumination is now becoming a key driver of sign graphics, lighted walls and façades. This has encouraged the development of vinyl that can support graphics and images. These come in a variety of opacity levels as films or meshes. The ability to change color and appearance between day and night also has been a key area of focus with new vinyl materials.



Perforated vinyl is another approach to creating day/night lighting effects.

COLOR AND SPECIALIZED SECOND SURFACE VINYL

One major attribute of using vinyl is that it can achieve color matches at a value price. This makes it an ideal substrate for additional second surface digital printed graphics, particularly for brand environments. Colored and textured vinyl for second surface printing has seen extensive growth in interior and exterior wall applications, with fabricators combining multiple substrate vinyls with print graphics.

HIGHLY DURABLE PRINTED VINYL

These printable vinyl materials can be applied with a heat applicator to a variety of substrates including brick, stone and concrete. Developed for high intensity environments that include extreme weather conditions and human tactility, these materials are being used for durable interiors like parking garages and retail flooring.

DIRECT PRINTING TO FABRIC

Fabric manufacturers have made enormous strides in recent years in making fabrics and meshes that can be directly printed. While these fabrics do not have the same level of durability as dye sublimated graphics, the gap between the two processes have been narrowing in recent years with improved inks and coatings that can enhance the longevity of the material in the environment.



Mural design has become a digital process with the development of specialty vinyl that can be applied to rough material surfaces.

Printing on colored vinyl reduces price and ensures a close color match.



Direct printed fabrics have become more and more prevalent in longer term uses in the environment.

ATTRIBUTES OF DIRECT TO VINYL AND FABRIC PRINTING

Inexpensive to access and utilize

Dependable materials with extensive research and support

Can be combined with multiple substrates from glass to brick

Variable durability dependent on material quality and application

OVERVIEW OF DIGITAL PRINTING TECHNOLOGIES

EMBEDDED AND SUBLIMATED DIGITAL GRAPHICS

Embedded and sublimated digital graphics use heat and electrostatic methods to bind ink with substrate material. Sublimation technologies have existed in the sign and graphics industry before digital graphics, with baking processes on porcelain as well as powder coating of metal. These technologies are still prevalent today and continue to fill an important need in areas where decades of durability are needed, such as transportation and park signs.

THE NEED FOR QUALITY, DURABILITY AND ARCHITECTURAL INTEGRATION

Embedded printing approaches are used in locations where graphics must withstand vigorous environmental conditions for long periods of time or when the graphics need to be seamlessly integrated into a building or interior. Most of these processes are developed by outside specialists that provide warranties for longevity for indoor conditions and guarantees for most outdoor conditions.



Porcelain Enamel is used in places like the New York subway system where signs must last for decades.

EMBEDDED PRINTING APPROACHES DYE SUBLIMATION

Dye sublimation uses heat to transfer a digitally printed film to fabric and vinyl creating a durable surface that can withstand the elements. Dye sublimation is used extensively where outdoor durability is important, such as banners, awning and building wraps. Dye sublimated graphics are a key component of high-tech fabric structures.



Dye sublimated fabrics are durable, light and flexible.



Dye sublimated fabrics can take on fantastic shapes.



HIGH PRESSURE LAMINATE

This process presses graphics into paper using heat and pressure. High pressure laminates are used extensively in exhibition, park, and transit signs where tactility and durability are important attributes. Laminates can be fabricated at multiple thicknesses and can be thin enough to curve around surfaces.

FIBERGLASS

Embedded fiberglass is a long-used graphic process still being employed primarily for park signs and transportation. Fiberglass signs are not as precise as other approaches but the graphics are among the most durable. Since the graphics are deeply embedded into the material, it is scratch resistant and not as susceptible to ultraviolet light.

High pressure laminate is used extensively for park and transit signs that are both durable and tactile.



POWDER COATED GRAPHICS

Like laminates, powder coated graphics started in the building materials industry before being adopted as a graphic solution. Powder coated graphics can be applied to any surface that can be powder coated like wood, glass and metal. Because graphics can be applied directly to substrate building materials this process has been adopted for signs and panels that can be integrated directly into buildings, as well as complex curves and shapes.

Powder coated graphics can take on complex curves and shapes including perforated screens.

ATTRIBUTES OF EMBEDDED AND SUBLIMATED DIGITAL GRAPHICS

Durable and able to withstand harsh outdoor conditions for years

Can be integrated into architecture and interiors

Difficult to manufacture and usually outsourced

Can often be combined with a second surface coating for additional protection



DIGITAL PRINT TRENDS

BRAND ENVIRONMENTS

Large format printing has transformed the design of interior environments with architecture and interior design firms creating robust graphic design departments to take advantage of this work. While the movement started a long time ago with diversified architectural firms like Gensler, it has only accelerated in recent years. Most of the top 100 A/E, interior design and branding firms have in-house design teams specializing in brand environments and interior graphics. These groups have influenced their clients particularly in the retail, corporate, hospitality, and healthcare sectors to pursue unique interior branding with printing on vinyl and unique materials.



RTKL Office: Corporate offices have been one of the leading areas for experimentation using vinyl and fabric in interior environments.

OPPORTUNITIES

This trend has created new opportunities for sign companies, particularly those that specialize in large rollouts for corporations and retailers, but have also brought in new competitors, particularly in retail environments. The result has been a great deal of diversity with companies approaching the market segment from multiple directions. Another major beneficiary of this trend is the vinyl and fabric industry. Many of these interior environments utilize wallpaper and other surface material with more unique materials as accents.



Digital wall murals and wallpaper combined with dimensional signs have provided enormous opportunities for the sign and graphics industry.

CHALLENGES

The challenge is to differentiate higher quality companies, materials and ink from low cost competition, particularly in environments that require high durability like retail and healthcare. Success in the area of digitally printed environments requires that fabricators, material companies and designers understand how quality environments support organizational branding, particularly with the extensive unrelenting cost pressures.



Seattle Children's Hospital shows the need for quality materials, inks and coatings in interior environments.

BRAND ENVIRONMENT TRENDS SUMMARY

Architects and interior designers are pursuing graphic innovations with in-house graphic design teams.

The most aggressive digital push is in retail, healthcare and corporate environments.

Interior sign fabricators must compete with other specialized firms for interior environment work.

Direct to substrate printing has seen rapid growth but largest material increases has been in vinyl and fabric surfaces.

TREND INTERVIEW

BETH GILLISPIE | PRESIDENT | ACORN SIGN GRAPHICS

Digital printing has reshaped our business, transforming us from an interior sign company to an interior and exterior environments company. As a company dedicated to sustainable practices we experimented with ADA signs, focusing on photopolymer as a leading approach. We have worked to experiment with the material in conjunction with other substrates including 3form embedded graphics. We have also found that we can emulate this visual approach with direct-to-substrate printing for less cost and have the added benefit of the ability to customize for the client's design needs. Our experimentation in this area has led us to focus on printing on many different materials, both surface and subsurface.

With capabilities to use solvent, UV-cured and latex inks—often in conjunction with other fabrication processes such as laser engraving, routing, and vinyl and painting—we are constantly learning about the attributes and idiosyncrasies of digitally produced graphics under different conditions. Digital is still less permanent than painting and solid colors for paint may be superior, but there are so many surface approaches that work effectively.

Digital sign printing on unique substrates is an art that requires extensive innovation. We are particularly invested in new substrates with high recycled content and reclaimed materials such as

woods and metals. The two most challenging factors to using these types of natural and reclaimed materials are adhesion of the inks to the surfaces and anticipating how the texture and color of the surface positively or negatively affects the image. Clients are expecting us to provide complete environmental and placemaking solutions and to be digital print and material experts. The curiosity and skill of our designers and fabricators plus collaboration with our vendors and clients willing to invest time and resources in prototyping are key factors in creating momentum toward exciting digital applications. In particular we need to be able to achieve high-quality standards within budget.

BUILDING WRAPS AND GRAPHIC INTEGRATED EXTERIOR ARCHITECTURE

Digital graphics have been playing a significant role in building wraps and other innovations in Europe for the last few years, but are just starting to come to North America, mainly for more temporary structures like tradeshows and events. A few significant trends have occurred that are increasing the role of graphics at the architectural level.

Vinyl Innovation and Competition: Vinyl for exterior use has advanced in the last few years, along with intense price pressure and competition. New advances include utilizing multiple layers and translucent effects. The big challenge is ensuring longevity.

Architectural Innovation: Architects are growing more comfortable with specifying graphics for large scale building projects or as a complement to large glass curtain wall façades.

Embedded Graphic and Dye Sublimation: These technologies have exploded in the last few years through crossovers from other industries. Dye sublimated fabric has been a staple of the tradeshow and event industry the last 10 years and has since crossed over to building wraps and façades. Laminates and powder coated graphics on metal are a big industry in Japan as an alternative to wood and are now well entrenched in the sign industry.



Building wraps are a much larger trend in Europe than North America.

OPPORTUNITIES

With large format printing becoming commodified—particularly for opaque direct to vinyl prints—sign fabricators have been turning to architectural solutions that require higher level preparation and installation skills, including parking garages, banner wraps and other structures that require quality installation. There is enormous potential for companies that can improve on product durability for direct to vinyl and substrate solutions to overcome building owners' concerns of product failure.



Parking garages are seeing much more use of surface graphics.

CHALLENGES

Distrust of long-term durability is a key issue. Many fabricators distrust multi-year warranties since they see them easily voided by specific conditions. There are also difficulties educating the architectural community of the most recent innovations, a necessity since most major architectural graphic projects originate with design professionals. For glass façades, there has been a commodification of simpler processes as more print companies look for opportunities.



Digital printing on interior glass façades has become a commodity business.

BUILDING WRAPS AND GRAPHIC INTEGRATED EXTERIOR ARCHITECTURE TRENDS SUMMARY

Innovation in durability and flexibility of vinyl solutions.

To succeed in wayfinding, sign fabrication companies are diversifying their in-house digital print practices and developing close external relationships with specialists.

Software and documentation methodologies are key to digital print success.

Direct to substrate printing will most likely be a required element of architectural sign fabrication, particularly for custom signs.

TREND INTERVIEW

RUSS ROBERTS | PROJECT DIRECTOR | CREO INDUSTRIAL ARTS

In the architectural markets, where we predominantly work, we are seeing multiple trends. In retail and themed environment projects we are seeing a lot of applied images, particularly in parking structures and external environments. Still there are challenges, particularly in the preparation of substrates which is usually done by other trades and often fails. I am not blaming quality per se. Substrates are still a big issue and we are still working on how brick and stone can work effectively. Even if adhesion works there is not great fade resistance. We use standard UV overlay but the warranty that is offered by the manufacturer is not often of great value. We just share with the owner the realities of the benefits and limits of the products and put the decision on them.

The interesting thing today is that the manufacturers of digital printers want to get machines out there too, but are killing the market by

creating dozens of competitors within market regions. As purchasers, these companies offer us the moon. We are loyal to a few, but there are dozens looking to compete and they drive prices down. I would be reluctant to try to be an outdoor commodity printer anymore. Everyone that we see in the digital print industry is dealing both with price competition and rapid obsolescence. They have to always offer the newest and best product. If you cannot do something special it's best to stay out of it or outsource.

Direct to substrate printing is an exciting new area and we want to experiment in new methods of utilizing the technology and avoiding delamination issues. We have had good success with aluminum as a substrate. Finished metals work as effectively as composites but in the end decisions are based on cost. We would rather go with more inert materials, but our clients sometimes choose substrates that are more cost

effective and less enduring.

For longer term architectural uses we are seeing that digital powder coating is great for human level tactile solutions and we like how it holds up. Cost is still the big factor here and more traditional porcelain enamel companies are starting to move to digital approaches. Screen printing is still specified but it is a declining industry. We often are providing digital alternatives more frequently. The ability to digitally print true white is a recent advantage that is making this option more viable.

As for some of the wilder solutions you see, like 3D printing and fabric structures, the demand just has not arrived here yet. We are using 3D printing to help us create details in some of our work. Designers are trying to push the envelope using mainly existing processes, but when they drive us into new areas we will strive to keep up.

DIGITAL GRAPHICS FOR INTERIOR AND EXTERIOR WAYFINDING

Digital printing has been a dominant system in wayfinding signs for the last three decades. A range of solutions extends from temporary direct printing to durable embedded graphics on laminate, fiberglass and porcelain enamel. The major trend, though, is the sheer diversity of printing approaches that environmental graphic designers and sign fabricators need to understand to specify correctly for a range of interior and exterior environments. These issues include:

The Balance Between Unique and Modular Solutions: Processes like screen printing are still high quality and cost effective for large numbers of similar signs but direct to substrate printers are catching up.

The Balance Between Tactile and Large Surface Signs: Direct to substrate printers are becoming a necessity for interior signs, particularly directories and ADA identity signs that are tactile and change rapidly. Direct printing to vinyl is a dominant part of repetitive larger wayfinding signs.

The Balance Between Short-Term and Long-Term Exterior Solutions: The expansion of embedded graphic digital solutions on multiple materials has spurred an ongoing discussion between end users, designers and fabricators about the durability of signs in harsh outdoor conditions. This is complicated by continual advancements in surface and embedded technologies.



Combining direct to substrate environmentally friendly UV printing and ADA signs adds another dimension to existing processes.

OPPORTUNITIES

Except for the simplest of interior signs, digital processes require a high degree of fabrication skill to achieve high quality and efficiency. There will be a much greater integration of signs and interior/exterior environments, providing more opportunities to expand printing operations. Another exciting new area will be to combine printing and modular production, expanding the ability to produce unique sign systems. Finally, durable embedded graphics continue to drop in price and increase in durability, creating opportunities to easily outsource these graphics and combine with internal systems. These specialist companies will improve at working with the sign and graphics industry as well.



Numerous composite materials are being developed for better direct to substrate printing including wood, aluminum and plastic.

CHALLENGES

The complexity of developing ADA and wayfinding signs will limit competitors into the market, but will also force companies to maintain extensive in-house flexibility, keeping strong internal vinyl application and screen printing practices, while adding direct to substrate printing. Software needs will continue to be difficult to resolve, since there are still few software programs that can combine CAD and digital graphics, though these have improved in the last few years. Sign and graphics companies that can integrate their software applications into an expanding mix of printing options, whether in-house and outsourced, will be in the best position to succeed.



Embedded graphic approaches require a specialist as knowledgeable as a sign fabricator.

PRINTED ENVIRONMENT TREND SUMMARY

Sign fabricators have many more diverse options to fabricate wayfinding signs based on price, durability, longevity and changeability.

Fabricators must find ways of balancing different printing processes in the environment based on durability and tactility.

Traditional approaches will still be utilized for large scale printing while direct printing dominates singular projects.

Fabricators will need to become specialists in judging longevity and durability needs for exterior environments based on the specific environmental issues like sun and pollution.

TREND INTERVIEWS

PETER SCHERER | PRESIDENT | H PLUS INC.

As an environmental graphic designer, I have made it my business to know as many different types of graphic print processes as possible from highly durable embedded inks to vinyl and direct substrate printing. The technology keeps changing and designers need to work hard to stay on top of it. For highly durable graphics, I still think porcelain enamel is the gold standard. We have projects that are still out there 20 years later,

but powder coated graphics are making a strong run and could be a bridge between the more temporary materials and the expensive and complex porcelain signs.

For shorter term solutions, screen printing is still strong, but direct to substrate is getting better every day. There are still strange issues with ink pooling that need to be resolved, but color matching is excellent and it works better as a second surface. Screen

printing will stick around based on repetitive signs, but it does not make much sense when there are a lot of unique elements. My advice would be to get to know your fabricator or printer well and work closely on mocking up ideas. Results change quite a bit based on the ink, material, surface and technology so it is important to be open to experimentation and not make hasty conclusions as a designer.

SETH DAVIS | PRESIDENT | URBAN SIGN

You just cannot survive as an architectural sign fabricator today without a flatbed printer. We still do a lot of screen printing and it is great, but no one is willing to pay the money for screen printed directories and other complex information. We now create a matrix of graphic approaches to balance durability, quality and price. We use a lot of vinyl for more durable non-tactile graphics, switching to a flatbed with a clear coat UV inhibitor (which we achieve

through extensive consultation with our coating supplier) or clear powder coat for outdoor applications, and then jump to powder coated graphics, porcelain or phenolic for high end durability.

One thing we have to do is consult extensively with our paint, ink and material suppliers on what is possible. That is what separates sign fabricators from most large format printing companies. We dedicate our craft to printing in the environment, which

is a specialized art. When we outsource it is only to companies that get that fact.

Our biggest challenge right now is actually software. We experiment extensively with graphic and CAD based software as well as cutting software. The holy grail is one software tool with a robust handling of graphics, strong CAD documentation (at least in two dimensions) and an easy ability to transfer to our router and vinyl cutter software.

DIGITAL PRINT TRENDS

PRINTING AND MATERIAL FLEXIBILITY

One of the largest areas of experimentation in digital printing today has been in the use of new materials and their applications in different environments. This experimentation has taken on three forms:

Direct Printing to New Materials: Direct to substrate printing has opened up extensive experimentation into printing on diverse materials, from natural woods to metals.

Printing Combined with Manufacturing: The combination of printing with engraving, cutting and molding to create different effects including lenticular, layering and dimensional graphics.

New Approaches to Durable Graphics: In addition to embedding graphics into different materials, sign companies and manufacturers have been working to extend the life of graphics through new topcoats, embossing and clear layers.



The ability to print on just about any material opens up endless possibilities.

OPPORTUNITIES

Companies that aggressively experiment will find extensive new possibilities for material applications. Greater education in the architectural and brand community will create new and more extensive possibilities. Combining printing and cutting will expand sign fabricator opportunities to develop new effects and approaches.



Layering graphics with material carving expands on the fabricator toolkit.

CHALLENGES

Education will be the largest challenge facing companies looking to experiment with new materials and processes. There are few places to find best practice applications for fabricators to utilize in their work. Lack of understanding among the design community may keep prospective ideas from being applied.



Manufacturers like printer and software company EFI are creating displays and educational programs that highlight innovative printing applications.

PRINTING AND MATERIAL FLEXIBILITY TREND SUMMARY

Direct to substrate experimentation is providing a wide range of material and dimensional effects.

Combining printing with existing cutting and layering methods is expanding the toolkit for sign fabricators.

Lack of education and best practices in the design community is keeping many new and exciting practices from seeing adoption.

One of the largest areas of experimentation is extending the longevity of existing graphic materials.

TREND INTERVIEWS

KEVIN ROURKE | NATIONAL ACCOUNTS MANAGER | DMA

It is an exciting world for digital printing with the literal reinvention of existing ways of working. The biggest change has been the introduction of durable white curable inks for flatbed printing. This allows the creation of a second surface for a wide variety of materials at a much higher resolution. Even more significant is the combination of laser etching and printing,

either to remove materials or provide another layer to graphics. Additional processes like thermoforming and embossing to acrylic provide a similar effect. The result is an application on multiple surfaces and dimensioned effects.

The world for vinyl and fabrics graphics is changing completely, from a medium for wallpaper and surface

graphics that reinvent interior and exterior spaces. The biggest issues preventing these innovations from finding practical use is education. The design community needs to be aware of the applications for use in all these approaches. Sign fabricators and material manufacturers have to get much more aggressive with introducing new approaches.

ROBERT LEE | PRESIDENT | UNICORN GRAPHICS

UV inks are improving in adhesion every day, making direct to substrate the most exciting new business in printing today and one we have dedicated our business to expanding. Right now, we are predominately 99% interior use with market areas in retail and corporate marketing. Many designers

are seeing the greater artistic effect from material printing as a marketing tool, as well as photographers and other image makers wanting to see their work on more interesting materials. Much of our work is coming from more generic substrates like plastic and sintra which are dropping in price and improving in quality.

But what is really exciting are the more exotic materials. We have an extensive library through experimentation and from crazy inquiries in the industry. We are also seeing more requests for unique combinations of printing and dimensionality. To stay on top of the industry, we will try anything.

TEMPORARY AND PERMANENT SOLUTIONS



Many building graphics are meant to last one year, but often stay up far longer.

One of the biggest skills sets for sign builders in employing digital solutions has been in being able to balance the temporary and permanent requirements for buildings and signs. This is a particularly difficult set of competencies since the printing technology changes dramatically over a short period of time. There are three particular time periods that require careful management of temporary and permanent solution decisions:

Up to One Year: Most temporary solutions might be needed for a few weeks, but more often are in place for six months to a year. While these can be handled by direct to substrate and vinyl graphics there is a considerable difference in durability between material and inks. In addition small decisions like placing graphics inside windows can yield enormous changes in longevity.

One-to Five Years: During this time period the environment starts taking a toll on even the most durable materials. Many companies have a five-year guarantee, but these are often voided by specific environmental conditions including pollution and exposure to sunlight. Sign and graphic company skill sets become much more dominant at this stage since the use of additional coating and laminates can play a major role in longevity.

More than Five Years: After five years, even the most durable graphic methods begin to break down. Most embedded solutions, from dye sublimation to powder coated graphics, are built to withstand long outdoor periods. But even these solutions require careful preparation and placement if meant to survive in difficult environments.

OPPORTUNITIES

Many large format printers do not specialize in or even understand long-term durability issues so sign and graphics companies that can master these strategies can succeed. This includes mixing and matching different solutions based on a particular need, keeping a wide variety of solutions in-house and having strong relationships with outside vendors. Sign and graphics companies can differentiate themselves by marketing different approaches based on durability needs.



Some graphics are required to be in the environment for decades.

CHALLENGES

There is a lack of information in the end user community—where most durability decisions are made—about what processes would work best for certain applications. There also is a lack of understanding of the durability differences between inks, coating, materials and processes. The rate of change makes it difficult to judge the performance of specific solutions.



Printing on thermoformed plastic is just one new technology that is revolutionizing that way we look at printing on signs.

TEMPORARY AND PERMANENT SOLUTIONS TRENDS SUMMARY

Sign builders have a wide array of potential solutions based on short- and longer-term durability.

Most digital printing techniques that can be mastered in-house will last up to five years. After five years most methods require outsourced approaches.

There is a significant expertise difference between sign builders and the large format print industry in managing durability issues.

End users often do not have adequate information for making durability decisions.

TREND INTERVIEWS

BRYAN STOCKDALE | PRESIDENT | WINSOR FIREFORM

Often when people consider an established technology like Winsor Fireform Porcelain Enamel, they assume that its continued viability is threatened by new materials, but we are busier than ever. Our growth is driven by new uses for our material. For example, in the architectural market

we are now manufacturing special applications that incorporate LED lighting and specialty logo printing for brand environments. This has required us to expand our capacity to handle much larger sizes and shapes. We are also seeing a great deal of mixing and matching with our material combined with

more temporary vinyl and even materials like phenolic or powder coated graphics for maps that may need to be changed out. Fabricators are becoming much savvier about the balance between durability and change, and we are finding a place in the mix.

ERIC KOSLOW | VP DEVELOPMENT | DIRECT EMBED

While powder coated graphics have been around for a long time it is only in the last few years where the technology and expertise has reached a level where the process is now part of the handful of durable approaches that dominate

the sign market. Our biggest challenge—and this probably is the case among all durable graphic manufacturers—is education. The more end users, designers and fabricators know about the best places for durable approaches, the more

they can begin making rational ROI decisions to balance price and quality. We dedicate considerable resources to educating the community and that is where we are seeing the largest success in return.

DIGITAL PRINT TRENDS

GRAPHICS AND ILLUMINATION

A large percentage of the sign industry is devoted to sign illumination through internally illuminated sign boxes and externally illuminated surfaces. The large format digital print revolution has radically changed what can be achieved with sign illumination, opening up vast new opportunities including:

Illuminated Architecture: The current trend in new urban architecture has been the use of a glass curtain wall as the key architectural element. With advances in curved and tempered glass, entire buildings can now become a platform for illuminated signs using translucent and reverse sign films.

Light Box Innovation: Dye sublimated and direct surface fabrics are beginning to dominate the interior light box industry. Direct to substrate flex face printing is achieving considerable momentum for exterior signs.

External Illumination: Perhaps the most popular approach for large format graphic signs, external illumination, is inexpensive and can be used in coordination with other architectural elements like awnings, brick walls and landmarks. Vinyl that can be adhered to rough surfaces has become popular for external illumination as well as fabric wraps.



Translucent materials and illumination has been among the hottest areas in graphics.

OPPORTUNITIES

The greater trend in architecture and interior design is to create more transparent environments that can serve as a platform for internally and externally illuminated graphics. This requires additional expertise that sign companies can take advantage of, including lighting specification and application of translucent and opaque print surfaces. The increasing popularity of light boxes and projected illumination also create expanded opportunities for further integrating signs into interior environments.



Illuminated surface glass graphics has advanced through experimentation in layering and dimensionality.

CHALLENGES

Illuminated graphics has brought new players into the sign market including retail fixture companies and large format printing companies. Currently these signs are relatively unregulated by sign codes, but this is starting to change as towns start controlling graphics on glass surfaces. Higher level illuminated graphics requires extensive technological and installation expertise that requires greater training and experience.



Digital printed fabrics and meshes are popular in Europe for illuminated wraps for building and construction sites.

GRAPHICS AND ILLUMINATION TRENDS SUMMARY

Glass façades have increased the number of opportunities for illuminated graphics.

Light boxes are becoming a key element in retail signage.

Manufacturers are developing reflected, perforated and translucent materials to take advantage of illumination.

Dye sublimated fabrics and direct to surface printing on plastic are becoming the leading approaches for lightbox printing.

TREND INTERVIEWS

GUY KALLMAN | SENIOR TECHNICAL SPECIALIST | 3M

Printing on translucent material is an important process within the sign and graphics industry, providing sign makers a creative path forward in generating unique and specialized graphics. As a manufacturer of both inks and substrates to the industry we do recognize major issues yet

to be overcome, including control of ink adhesion, uniformity and color saturation. Many of these challenges are focused on issues that impact the sign community today like color uniformity, consistency and high durability. Light control is another key consideration in our

brand-centric market, driving us to continually innovate in areas like LED optimization and energy efficiency. At 3M, we remain focused on providing materials and solutions that ensure these challenges can be met while providing the most flexible solution sets to our customers.

JIMMY JONES | PROJECT MANAGER | ADGRAPHICS

We do a lot of window graphics for buildings and they are mainly vinyl building wraps. Most are temporary, lasting a year or less. Most of our printing is on translucent material and the quality of translucent prints are incredible today. Where we have

been excelling is in our creativity with these processes, including reverse graphics to minimize vinyl and using multiple layers of black and white ink. With these skill sets we have seen massive yearly growth of 6-8 percent in this area, particularly

from developers of malls and apartment buildings. Our clientele is looking for strong in-house teams that can provide creative design support and flexibility including direct to substrate printing.

DIGITAL PRINT TRENDS

PRINTERS AND FABRICATORS

Any new technology or innovation disrupts industries, by either augmenting existing business, creating new businesses or reinventing entire industries. This is especially true in large format printing where three trends have been occurring.

Printer to Fabricators: Many large printing companies have moved more heavily into the signage industry, particularly for interior and placemaking applications. In markets like corporate marketing and retail, printers have developed a high level of expertise in interior placemaking, where they have tried to dominate all aspects of interior construction.

Fabricators to Printers: Fabricators are using large format printing approaches to increase their specialized expertise in custom interior and more complicated exterior work. Fabricators have been able to take advantage of their exterior installation expertise to make printing a considerable value-added element to existing businesses.

Crossing Disciplines: Companies that never thought they were in the sign industry have found that digital graphics have moved them closer. This includes packaging companies that are entering the fixture market, display companies developing interior sign expertise and exhibition firms expanding their role in interior placemaking.



Specialized architectural exteriors have widely expanded the sign fabricator toolkit.

OPPORTUNITIES

Sign companies have expanded into new areas particularly in markets once reserved for construction companies like interior placemaking. Sign companies also are using printing to separate themselves by integrating into their custom fabrication operations, particularly by combining multiple processes together or focusing on durable approaches.



A big challenge for the sign and graphics industry will be printing companies moving into areas like exterior signage.

CHALLENGES

Print companies are turning large format printing into a commodity making it harder to make money utilizing traditional practices. Printing efficiency also can push radical innovation that can disrupt existing practices. This can include automated dimensional printing and cutting—transforming the existing wayfinding sign industry—or automated dimensional sign production that combines fabrication, printing and painting.



Interior placemaking will be a big growth area for fabricators moving forward.

PRINTERS AND FABRICATORS TRENDS SUMMARY

Sign fabricators have many more opportunities to integrate digital printing into their toolkits, particularly for exterior environments and interior placemaking.

Print companies are making significant inroads into the interior sign markets.

Companies outside the sign and graphics industry are expanding into interior and exterior placemaking which require signs, but this is balanced by sign companies making the same inroads.

Commodification of once-custom processes have become a major threat, particularly for wayfinding and ADA signs.

TREND INTERVIEWS

STEVEN OLKEN | SENIOR ACCOUNT EXECUTIVE | APPLIED IMAGE

We are a large format digital print company with a reputation for high-quality design solutions. Lately we are becoming a signage and placemaking company as well, for environments ranging from healthcare to retail. Just about 100% of our work is digital, split evenly between direct to vinyl and direct to other substrates.

For direct to vinyl, it pays to invest in higher-quality materials. A lot of printers are getting into this game and falling flat on their faces by not

having a clear idea of the need for high level inks and vinyl. In addition, installation requires extensive skill sets today since most of these materials are going onto widely different surfaces from glass to drywall to concrete. Being a large format print specialist is just much different than most other areas.

The same is becoming true with direct to surface printing. I walk around with a library of samples of vinyl and substrate surfaces to educate designers and clients on what

makes the most successful solution. Shopping malls and corporate offices have fallen in love with the idea of printing directly onto benches and other tactile surfaces. Inks are improving every day, but you have to work in this area constantly to be effective. We have recently bought a high level CNC router, bringing sign fabrication together with direct to print. Through these technologies we are becoming a hybrid printing/sign company.

MICHAEL QUIGLEY | VP OPERATIONS | SIGN AGE OF TAMPA BAY, INC.

There is so much crossover in the industry today and everyone is looking for the magic bullet that makes them a strong market competitor. Many traditional screen printers are moving to digital, which has produced more problems as companies new to the technology do not have a clear understanding of color management with which big brands are obsessed.

That is where we have focused our business. We use our color matching proficiency as a central skill set. To date,

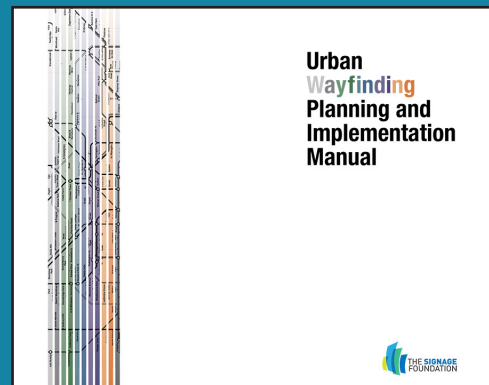
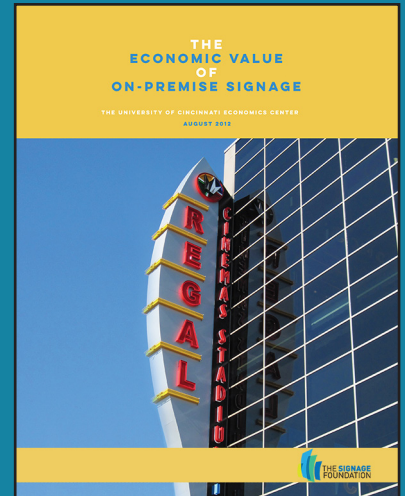
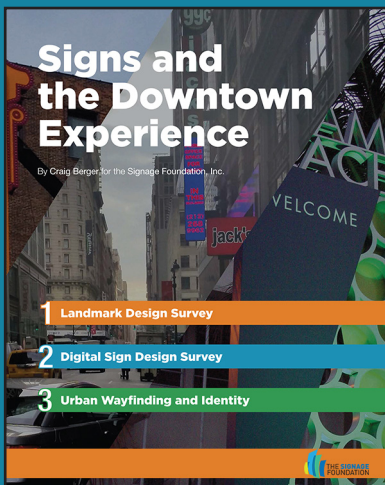
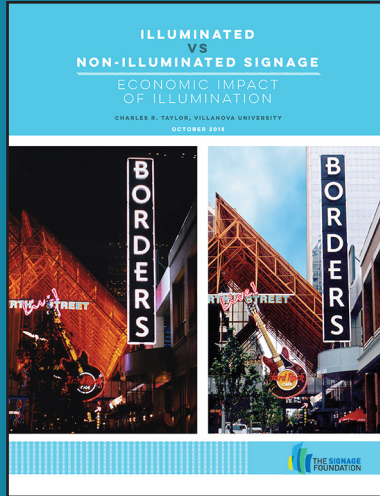
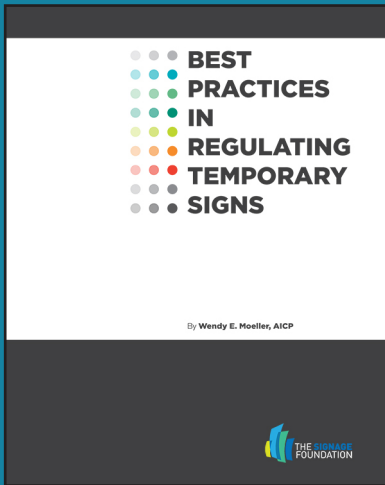
we have avoided direct to substrate since we haven't found the flatbed printer that produces the deep, rich colors our current customer base demands. Our focus is on vinyl and paper printing. Labor is a much bigger cost than vinyl, so it pays to buy quality materials given the type of specialized work we do with corporate clients and brands.

Our technical expertise has led our business into some interesting areas including murals, wraps, fabric and wall partitions.

We are not early adopters but will jump on new technology as it becomes important to meet client needs. Dye sublimation fabric is one with a lot of potential. Our key focus though will stay color control. Getting G7 certification was central to this focus, which has allowed us to stay on top of cost control and efficiency. Our biggest cost focus now is printing with white inks. It requires careful relationship-building with the printer companies but staying on top of these issues yields enormous rewards.

Visit the Signage Foundation Library for additional research and resources.

www.the-sfi.org



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