

# Developments in the digital production of High Quality Original Art – A case study

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## Abstract

*The Centre for Fine Print Research at the University of the West of England Bristol undertakes collaborative projects with a wide range of artists to disseminate the results of the Centre's research. These projects in themselves often generate new ideas and further research.*

*In the past twelve months the Centre has commenced a major project with the Internationally renowned artist Richard Hamilton, who is perhaps the UK's foremost painter and printmaker. Now in his eighties Hamilton has recently embarked on a new series of digital canvases with various degrees of over painting for a major exhibition. The paintings have developed over four years and during this period Richard Hamilton has tried a number of different methods to achieve a high quality photographic image on canvas. His aim had been to find an inkjet canvas that had similar qualities to the high quality linen he used for painting, no suitable canvas existed so he approached the Centre for Fine Print Research for assistance. The Centre has also been discussing with other artists the lack of a good quality canvas that met the requirements of the professional artist who wished to paint on top of a digitally printed surface with oil paint.*

*For this project the Centre has worked closely with Hewlett Packard to develop a special inkjet linen canvas that strives to meet the exacting requirement of the artist and conservators at the Tate Gallery and Getty Museum. In addition the canvas coating had to be receptive to a twelve-colour ink set and maintain good gamut and smooth transitions on the irregular surface.*

*The paper will document the reasons for the artist's choice of canvas and demonstrate the differing surface characteristics required. It will also follow the path of development from an early canvas in the series through the inter stages to the final product*

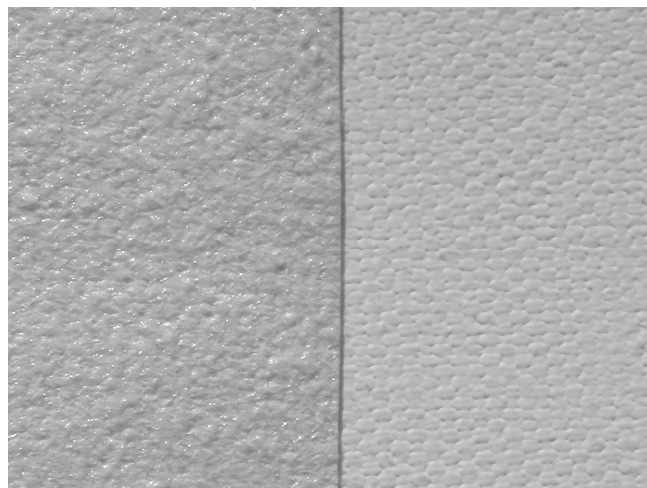
## Introduction to Artist's Canvas

For a good definition of what constitutes an artists canvas it is useful to quote the standard reference work for Artist's materials Ralph Meyer [1] and the following paragraph is a comprehensive definition of the products.

'The word "canvas" does not refer to any specific material in the field of textile fabrics, but is applied to a number of closely woven materials of relatively coarse fibre. In painting, the term "canvas" generally implies a coated fabric, ready for use.....The best linen in the world comes from flax grown in Flanders, Belgium, and the Netherlands as well as some Eastern European countries. A variety of lesser quality is available from Asia. Cotton canvases such as sailcloth and twill came into occasional use as a flexible support for oil painting after the commercial production of cotton, but they are entirely inferior to linen; they stretch poorly, they tend to give an inferior surface, and most of them do not take the size or priming well. Only the more expensive, closely woven heavy cotton duck is suitable for painting. The best natural material for painting, however, is a closely woven, pure linen with the threads of warp and weft equal in weight and strength.'

Artists first used canvas early in the fifteenth century, but it was not common in Northern Europe until the sixteenth century. It has remained the primary choice for painters ever since. The first major challenge to oil paint on canvas came with the introduction of Acrylic polymer paints in the nineteen fifties and sixties, this brought with it a more popular use of cotton duck canvas, New technology and digital printing bring with it a new set of challenges and opportunities for the traditional painter.

With the development of wide format printing came the adoption of printing using ink jet by artists. This use by artists began in the early nineteen nineties and grew rapidly. The acceptance of digital print by the art market has been well documented, for further information a paper by Henry Wilhelm [2] covering the history of wide format printing for artists was presented at last years NIP 22 conference. In parallel to the developments of the technology for artists and photographers was the demand for an ink jet printable canvas that initially was primarily used by the corporate and interior decoration market. These early products were developed to present very "canvassy" characteristics. To artists, these products appeared very artificial and plastic in appearance. This can be seen from the sample on the left of the photograph in figure one.



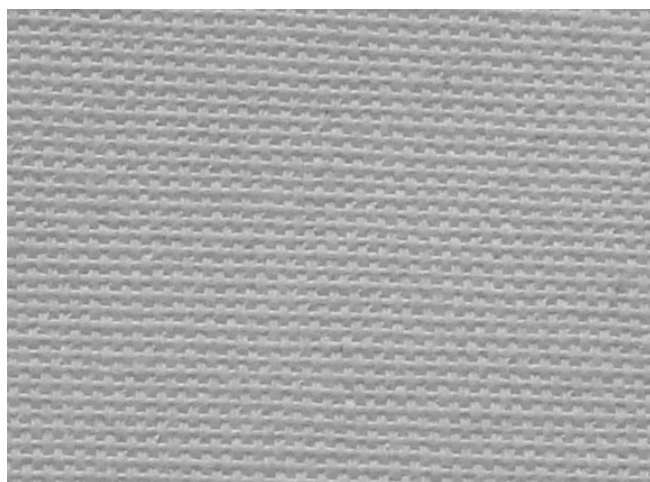
**Figure 1:** Left: Early inkjet coated canvas, Right: current inkjet coated cotton duck canvas

## The art market

The art market in general including wide format digital printing for artists divides into a number of differing strata, from the mass production high volume market, where an artwork is reproduced in many thousands and may sell for a relatively low price. Right through to the blue chip museum end of the market, where an artwork can sell for many millions of dollars.

It is at this point that we need to define what a blue chip artist whose work is of the highest quality, collected by museums and whose work can sell for many millions of dollars means by a suitable canvas and how this differs from the industry definition driven by low cost, high volume, even though in the current inkjet market low cost and high volume can both be very relative terms. A definition of the products currently on the market also has to take place in order to make realistic comparisons.

First one has to deal with the current canvases produced by most manufacturers of media for digital printing. It is important to understand this segment of the industry is driven by an easily identified volume market for these products and was defined by the early adopters of wide format ink jet printing, because they could afford the initial high costs of the technology. These early adopters were and are the high volume reproductive art producers for the interior decoration hotel and office who were initially targeted by the manufacturers. This market required a product that was based on the cotton canvas, which they and their artists were used to working with. This is usually a heavyweight bleached cotton duck canvas made from 100% cotton fibre.



**Figure 2:** Uncoated cotton duck canvas, not the regular and uniform weave pattern in comparison to the sample in figure 3

Due to the cost sensitive and relatively high demand in volume for these products, the popular canvas developed on a base of cotton duck canvas. The result with an acrylic gesso coating (gesso is traditionally made from a rabbit skin glue plus calcium carbonate and titanium white) is now of a good quality and suitable for the majority of artists demands. The result is a less visually harsh surface that is relatively pleasing to the eye, but quite mechanical in its appearance and structure. Most of the current research with cotton duck artist canvas is related to surface cracking when the canvas is stretched onto a frame and for good quality laminate coatings to protect the surface and enhance appearance. The canvas sample on the right of figure one, demonstrates a good example of a current canvas

The problem for the Blue Chip museum artist with this product is its uniformity and regular structure, these artists are used to the highest quality Belgian or Irish Linen that has been a staple product for the best artists using oil paint since the Sixteenth Century.

The artist wants the best quality available to him, with less regard to the cost. In this case the highest quality linen canvas,

these products are inherently smooth and soft to the touch, have a natural colour which ranges from pale straw to mid grey brown and although the warp and weft are usually of equal thickness, linen canvas has a naturally irregular thread as can be seen from the samples of uncoated linen tested in figure four.

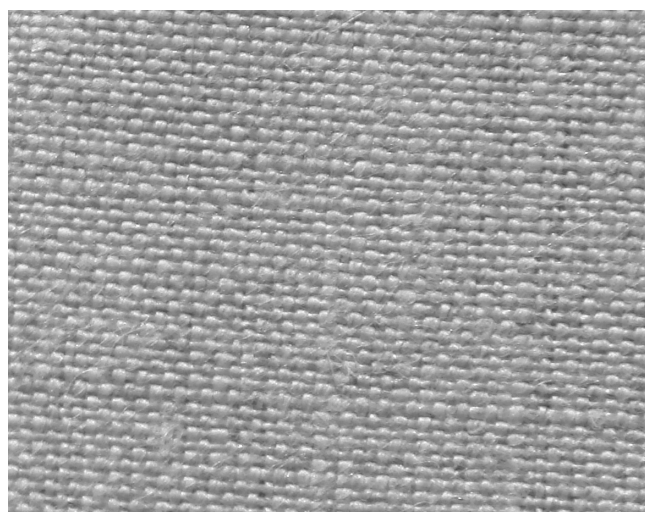
### ***The problem***

In order to solve the problem of a canvas that artists would find better suited to their needs and desires. A number of secondary problems first have to be solved. These break down into:

- The correct sort of canvas both as a support and a visual medium for the artist.
- The need to put on a priming coat and ink jet receptive layer.
- The quality of the print and its visual appearance.
- The need to protect the surface from marking and scratching, as most canvas, when displayed will not be glazed.
- What sort of protective coating is available on which one can paint, that will accept oil pain, and will still remain conservation friendly.

### ***Choosing a suitable linen canvas***

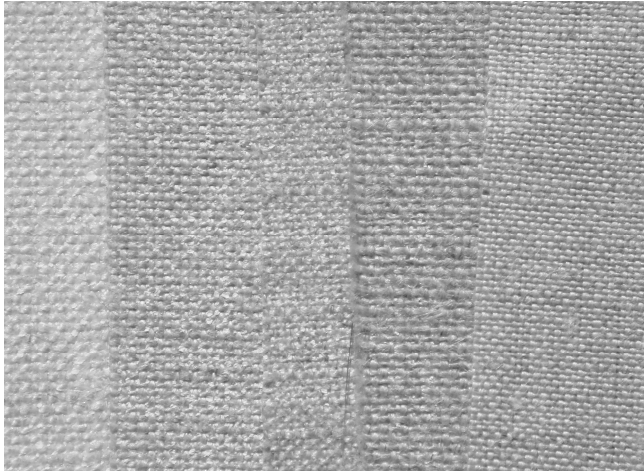
The first task was to identify suitable linen of the highest quality, as a reference sample, which was also the right weight and had a pleasing appearance, as previously stated the best quality linen is usually Belgian. A standard canvas of the highest quality was identified through Russell and Chapple, London suppliers of artist's canvas since 1782. The linen chosen was super fine artists linen which Russell and Chapple identified as the finest, smoothest linen woven to the highest standards. However this description is slightly misleading because linen is a natural fibre made from flax which when spun has a random inconsistency of thread thickness creating a slightly uneven and irregular woven structure. It is this irregularity that appeals to artists. This reference sample allowed HP to identify a suitable linen, which would also take an ink jet receptive layer without compromising the qualities desired by the artist. See figure three for woven linen texture.



**Figure 3:** Uncoated linen canvas reference sample of superfine linen

### ***Priming coats and receptive layers***

Traditionally the coating that artists' use for priming a canvas to make it receptive to paint is a gesso (see above), the method of application is to apply a series of thin coats. these are applied one at a time, allowed to dry and sanded smooth before a fresh coat is applied. Gesso is usually the favourite painting surface for an artist who uses oil paint. In recent years, these coatings have been made from acrylic polymers instead of the traditional rabbit skin glue. But still retain the whiting (calcium carbonate) and titanium white. For this project, a canvas coating made from acrylic gesso was sought which would take the ink jet receptive barrier layer necessary for the application of the ink. A number of different canvas' and coating were tried, see figure four.



**Figure 4:** Samples of uncoated linen canvas tested, reference sample on right

The final choice was a canvas that consistently the artists felt showed the best visual characteristics but was also available in suitable pre-coated quantities for a trial run of the HP ink jet receptive coating layer.

### ***The quality of the print and the printed surface***



**Figure 5:** Printed sample of HP Cotton duck canvas printed on an HP Z3100 using a custom profile created for the canvas

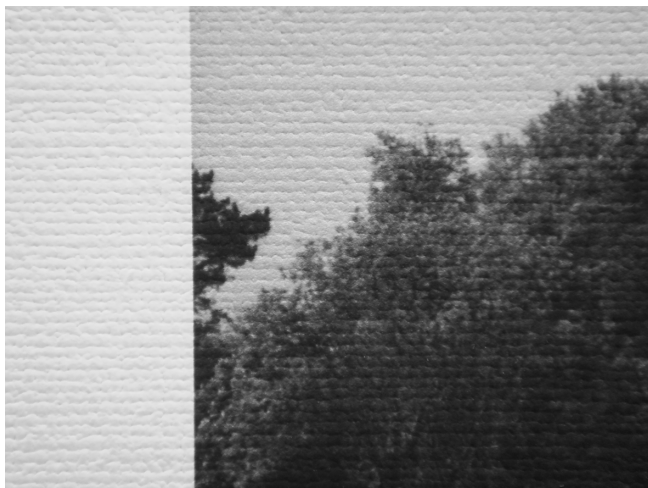


**Figure 6:** Printed sample of the new, coated linen printed on an HP Z3100 using a custom profile created for the canvas, comparisons of print quality show very little difference in the ink jet quality

After extensive coating trials, a suitable combination of ink receptive layer and gesso coating was produced. Colour profiling to produce an ICC printer profile was undertaken, for both the new HP Design jet Z3100 and HP Design jet Z6100. The aim from the start had been to utilize the full sixty-inch width available in the new HP6100 in order to produce a very large canvas at least fifty-six inches high, whilst still having the ability to use the full twelve-colour set offered by the HP 3100. A high quality result was obtained which is directly comparable to the image quality of the standard HP cotton duck canvas. As can be seen from the images in figures five and six. However the surface appearance and visual characteristics are greatly improved as can be seen in the exploded views, figures six and seven. These differences may appear very small but in subjective aesthetic terms to an artist these changes represent a major improvement.



**Figure 7:** Exploded view of the HP cotton duck canvas both printed and unprinted surface, note the regular weave and even surface



**Figure 8:** Exploded view of the new, linen canvas both printed and unprinted surface, note the variation and less regular weave pattern. The image quality is almost identical any variation between Fig7 and 8 is due to differing light conditions.

### Protecting the surface

The new linen canvas produced may be greatly improved but the surface of the ink jet coating, on the canvas, is still highly prone to damage through scratching, scuffing, watermarks, etc. in order to be exhibited with out glazing, the canvas needs a protective coating. From the point of the conservator, the coating applied may present as many new problems as those presented by the surface it is trying to protect. One has two options, at this point in time, the first is to apply a laminate coating, and the appearance of these coatings can add a depth and richness to the image. Conversely an unsuitable laminate can make the image look dull and yellow. The problem with these laminates is that they are often of PVC with a glue layer to adhere them to the surface. Although they are applied by heat and can be stripped from the surface, the PVC and glue make up of the coating gives the conservator cause for concern. This is mainly because PVC layers have a tendency to harden and go yellow. The other method available is to spray or roll on an acrylic coating, such as Liquitex matte, or one of the proprietary coatings offered by the ink jet canvas manufacturers. These coatings match well with the acrylic nature of the inks and can increase the gamut and enhance the look considerably, but from the conservators point of view as the ink and coating will combine together, thus works coated with these acrylics will be extremely difficult to conserve in future. This is due to the bonding of the coating with the ink, once applied it will not be possible to reverse the process.

### Oil Painting

The CFPR has been asked several times in the past two years to try out the available types of inkjet canvas on the market and recommend a canvas that would take oil paint. Most of these artists not only wanted an ink jet image of the highest quality on a specialist canvas, but they also required the ability to paint on to the surface with oil paint.

There are a large variety of available inkjet canvasses on the market and many coatings that will allow the application of acrylic paint. We have yet to identify a commercial canvas that has a

suitable surface appearance that will take a coating for oil paint that does not change its appearance or characteristics when coated.

If one tries painting on a canvas coated with these products the oil paint will not flow on the coating and it becomes very difficult to manoeuvre the paint across the surface.

The CFPR has been undertaking trials to identify a suitable protective coating, which would enable the use of oil paint on top. Initially we identified two possible routes. First the application of a laminate coating, in this case a hot glue PVC layer. In the early stages we were given to understand this was a Mylar layer and so would meet the requirements of a conservator in terms of long-term stability. However we have since discovered these layers are of PVC and although they take oil paint very easily and produce an excellent result there are obviously questions concerning the long-term stability of this method. The second route was to spray on an acrylic coating of liquitex matte as mentioned above, however there are still some concerns as to how easy it would be to undertake restoration of these works in the future. A third route is currently being investigated with the use of liquin oil painting mediums. This route may work well when the whole surface of the canvas is to be covered with paint. It is too early at this stage to publish the results.

### Conclusion

The collaboration with HP and the CFPR has successfully produced a new linen canvas that is much closer to the product that artists who paint in oil and expect the highest quality of materials are familiar with. The original request from the artist Richard Hamilton is still on-going, the exhibition took place, but the development took longer than anticipated. The major artwork that the canvas was developed for is still to be completed, but both the artist and the CFPR expect this to be completed in the near future. The canvas has already proved itself attractive to artists and already two further projects with the artists, Therese Oulton and Paul Hodgson are to take place using the linen canvas

### Acknowledgements

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### References

- [1] Ralph Mayer. The Artist's Handbook of materials and techniques, fifth edition Faber and Faber London 1981 ISBN 0-571-15067-5
- [2] Henry Wilhelm. A 15-Year History of Digital Printing Technology and Print Permanence in the Evolution of Digital Fine Art Photography – From 1991 to 2006 NIP 22 Final program and proceedings p308-315 IS&T Springfield VA ISBN 0-89208-263-1

### Author Biography

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