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INSTITUTING COMPUTERIZED WOVEN OR PRINTED TEXTILE DESIGNS WITH ADDED ADVANTAGE OF SHADE MATCHING

DP/IND/86/019

INDIA

Technical report: Assessment of the software and its application to a design centre*

Prepared for the Government of India
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Leslie Miller, expert in CAD for textiles

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United Nations Industrial Development Organization
Vienna

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* This document has not been edited.

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CONTENT

1. BRIEF.

To advise on and assist with the setting up of a Design Service for the textile industry, using the CDI design system provided.

To advise on methods of making the best use of the software, and on its application to textile design.

2. BACKGROUND.

The Computer Design System at BTRA.

Two workstations, one based on the Iris 3130 and the other on the PC, have been supplied and installed by CDI of Michigan, USA to form the basis of a CAD Design Studio. Peripheral equipment include a scanner, large digitising table, and video camera for input, plus a colour printer, plotter, and high-resolution Dunn camera for output.

The purpose of the system is to permit BTRA to offer a design service to the textile industry, plus training facilities in Computer Design for industrial designers.

The software supplied by CDI for both workstations can be summarised as follows:

a) Paintbox - for general freehand sketching.
b) Enhancer & Recolour - for colour manipulation.
c) Prints and Halfdrop - for printed textile design.
d) Big Image - for handling designs too large for the screen or scanner.
e) Segment & Apply - for texture mapping designs on to photographic images of garments.
f) Woven fabrics - for woven fabric design.

The software also includes Jacquard and Knitting facilities, but these were found to be totally inadequate for practical application to industry. As the Indian textile industry uses very little Jacqaurd or machine knitting, these options have been discounted are not considered in this report.

At the time of my visit the following items had not yet

been supplied by CDI (ten months from date of order), so assessment of these areas was not practical:

a) The Dunn camera - to assess suitability of output for enlargement and subsequent screen printing.

b) Software to link Digitising table - to assess potential for input of large saree designs, and their subsequent manipulation.

c) The Plotter and its linking software - to assess the output of large designs based on vector data to the plotter, and suitability for screen printing.

d) Software to print out production data for designs created under "Woven Fabrics".

3. PROGRAMME OF ACTIVITIES AT BTRA.

Familiarisation with and assessment of the CDI software as supplied.

Assist with the preparation of demonstration images for industrial seminar.

Assist in developing working techniques for:

- Colour compression of scanned images.
- Methods of producing colourways.
- Accurate alignment of scanned images.
- Using the Big-Image facility.

Demonstrate "Woven Fabric" software to visiting designers, and attempt simulation of their fabrics,

Group and individual discussions with BTRA team covering:

- Yarn count systems & fabric setting.
- Woven fabric structures.
- Basics of Computer Graphics and Colour displays.
- 8-bit and 24-bit systems.
- Elements of programming.
- Creating sample designs and structuring a Library.

Write software for Yarn Count conversion, and for Fabric setting. (CDI software only accomdates Denier, Decitex, and an unspecified count system; New software allows any known count system to be converted to another.)

Visits: Ruby Mills - weaving and printing
Weavers Service Centre - weaving.
Wool Research Association - CAD development.

Lectures: BTRA industrial seminar - CAD for textiles.

4. ASSESSMENT OF DESIGN SYSTEM.

4.1 Hardware.

In relation to the hardware requirements specified by BTRA, the choice of a CDI system probably represents the only real choice available. Based on a Silicon Graphics workstation, with software for woven and printed textiles, and supporting a wide range of input and output peripherals (scanner, video camera, digitising table, colour printer, plotter, Dunn camera) the CDI systems fulfills the requirements. The facility to texture-map a design on to a photograph of a garment is currently limited to CDI and Shima-Seiki (but the latter system is based specifically on knitted design), although this facility will undoubtedly appear on other systems within the next few months.

In terms of an integrated hardware system, the choice can hardly be faulted. It is unfortunate that the software capabilities were not given closer scrutiny.

The graphics display in both the Iris and the PC is based on 24 bits (see Appendix 1 - 24-bit and 8-bit graphics), making it particularly suitable for displaying 3D Solid modelling, and for scanned or frame-grabbed photographic images where the unlimited colour range helps maintain the delicacy and fidelity of colour in the screen display.

In all areas of textile design, photographic imaging as an end in itself is neither necessary nor practical. For printed textiles, six to twelve colours are typical, extending on occasion to over twenty. For woven and knitted textiles, ten colours would be a probable maximum, and although carpets may use considerably more

colours the likelihood of exceeding the 256-colour limit imposed by 8-bit systems is remote in the extreme. On the other hand one of the primary demands of any textile designing system is colour-manipulation facilities that are quick and easy to use, something not inherent to 24-bit systems. The inevitable conclusion must be that for textile design an 8-bit graphics system is not merely adequate, but is actually desirable.

Most 24-bit systems offer the facility to switch to 8-bit, giving in effect three separate 8-bit screens (an advantage for large images, and for building composite images). It is particularly surprising and disappointing that this has not been incorporated into the CDI software. A switch to "Colour-Map" mode is made in the Recolor facility, but the system immediately reverts to 24-bit on leaving the option, and does not permit the designer to stay in this mode for general design and paintbox activities.

A further frustration is the absence of a versatile zooming function on the Iris. It seems likely that the Iris does support a hardware zoom, but this does not appear to be used by CDI, and unfortunately the Zoom-Edit function which has been provided in software does not support the range of drawing facilities that are necessary to make it an asset. Only free-hand sketching, different brush sizes, and varying colour options are available in Zoom-Edit, so that a zoom facility is not available whilst using continuous line-drawing, segmenting, grid-locking, drafting weaves, or similar functions requiring accuracy of placement. (The hardware zoom function is implemented on the PC version.)

4.2 Software.

Whatever the potential of a hardware system, it can only provide the facilities implemented within the software, and in this respect the software provide by CDI for Woven-fabric design is extremely limiting (see Appendix 2 - Limitations of Woven Fabrics program), and the software for printed textiles is cumbersome to use (primarily because it is 24-bit based) and is not likely to give adequate fineness of resolution on large designs as it is bit-mapped rather than vector-based. (See Appendix 2. Printing Large designs.)

For any CAD system to be useable as the basis of a design SERVICE to industry, designing on screen is not enough in itself. The designer must be able to leave the studio with colour printouts and the full technical data to enable the design to be reproduced in cloth. At the time of this visit, suitable outputs for weave and print had not yet been supplied, so that an assessment of these capabilities has not been possible.

No software was available for printing out production details for woven fabrics designed on the system, and, although mentioned in the software specification provided to BTRA, there is no reference to printed output within the Woven Fabrics software. Without this software the value of the BTRA system to industry is considerably reduced. (NOTE: the "Demonstration" software provides a printed ticket, but this in incomplete and no colour pattern data is shown. The Demonstration software in general is incomplete, and is not being interpreted as relevant to this project.)

The software provided for Woven fabric design was found to be totally inadequate, and incapable of meeting the

needs of an industrial design service. (See Appendix 4 - Limitations of Woven Fabrics software.) Some designers from industry visited the unit with samples of their fabrics, and it proved impossible to reproduce these satisfactorilly on screen, and this particular exercise did nothing to encourage belief that the CDI system would be of value to the woven industry. It must be recommended that the design service should be initially confined to printed textiles, pending possible future improvements to the software by CDI.

In the case of printed textiles, output is required in the form of black-on-white colour separations of the component colours. This is provided by the software, but the absence of the Dunn camera (at the time of the visit) makes it impossible to assess the practical effectiveness of this output, particularly if images have to be generated on screen at smaller sizes than will be used in final reproduction - eg: large saree designs. It is recommended that trials be carried out to check the acceptable degree of enlargement as soon as the equipment is installed. (See Recommendations.)

It is noted that a plotter has been ordered as part of the system (but not yet supplied), but there appears to be no complimentary vector-based sketching software to accompany it. Without such software there is no way of generating a plotfile to drive the plotter. There is also no software to permit input of coordinate data via the large digitising table, although it is understood to be imminent; such data must inevitably be vector based, but whether image manipulation facilities (scaling, copying, rotation) will be provided, as distinct from merely tracing in an existing image, remains uncertain.

The main thrust of CDI's marketing is on the basis of scanning images into the system, manipulating them, and

outputting to printer or camera. When the manipulation consists of texture- mapping a scanned fabric on to a photographic image, the system indeed lives up to its claims. In terms of creating original textile designs - woven or printed - the software falls well behind a lot of its competitors.

Even when using scanned images there are problems of colour manipulation, and these can be quite serious when attempting to provide a design service to the textile industry. A common requirement will be to scan an existing fabric, and run a range of alternative colourings (this has already been requested by our first industrial contact.) However, it is not possible to directly change for example all the red in the image to green. The image must first be converted temporarilly into Colour Map mode, and the colours on screen are then "reduced" to the number of separate colours required in the image. The time taken by the system to carry out this conversion on a full screen-size image is over an hour. Even then the task is not complete, as the reduction will probably not convert every pixel accurately to the intended colour, especially where colour changes are fairly subtle. Further hand-retouching of the image will most likely be necessary before actual recolouring can start. This is obviously not the sort of task that can be carried out in front of a client while he waits, but it is probably the sort of service he will expect.

These comments on the existing software may well be regarded as being of negative value, as the system has been selected and installed. Nevertheless I think it is important for all concerned with the project to be aware of the limitations imposed and the problems to be overcome. It is essential that the designers who will use the system are familiar with the "difficult" areas,

so as to avoid making promises that can not be achieved. They must also have as much exposure as possible to ACTUAL industrial requirements so that they can learn to assess the best possible ways of meeting these requirements. This will not come from doodling in a vacuum, but from tackling genuine practical problems.

5. MARKETING THE DESIGN SERVICE.

The simple presence of a computer Design system does not in itself ensure a flow of commission work, but must be supported by dynamic selling of the capabilities of the Computer Applications Section at BTRA.

The importance of marketing the design service can not be emphasised too strongly, and necessitates building strong links between BTRA and the industry. That these links already exist in other areas of BTRA can safely be assumed, but it is unlikely that such links exist with the DESIGNERS in the mills, and this is where new associations have to be established. It is important to generate a feeling of confidence in BTRA's ability to tackle and solve industrial design problems and to provide a speedier and more versatile design service than can be obtained by traditional methods in the mill.

It will be necessary for the Design Manager to keep in touch with developments within the industry, and to be fully conversant with working practises. Knowing HOW the designers set about their tasks at present is essential in order to be able to offer an equivalent service on the Computer System. When discussing design problems with the Design Manager, it is important that designers from industry feel they are speaking to a kindred spirit, someone who understands their methods and requirements, and can offer "hi-tech" solutions. This relationship with industry can only be established by careful study of current practices, evolution of CAD techniques to emulate or improve on these practises, and sound marketing of this expertise.

It is essential to evolve a proper marketing plan, supported by suitable display material which will help

convey the potential of the system to prospective clients. An accurate costing of the services must be established together with a budget allocation for day-to-day consumeables.

The environment of the studio needs to be improved, with plenty of reference material immediately to hand, and work should commence immediately on building up a comprehensive library of designs and motifs - both as printouts for easy reference and as disc-files for speedy access and manipulation.

These aspects are dealt with more fully under "Recommendations".

6. STAFFING AT BTRA.

The staff of the Computer Applications Section at BTRA consists of five people, the project manager, two designers to supply the design service, plus one chemist and one physicist involved with colour-matching and dye prediction.

I was particularly disappointed by the environment and general atmosphere within the unit, as there was no feeling that the unit worked as a team, but rather as a manager and four workers, with generally low morale. Information does not appear to be disseminated downwards, and the designers have no real sense of involvement with the project. Initiative appears to be stifled rather than encouraged, and there seems to be an undue emphasis on petty discipline.

For any design studio to work successfully there must be a ready interchange of ideas, ongoing discussion, and a basic enthusiasm for the work being done. A good design team calls for skillful management, able to encourage ideas and stimulate initiative, with a full awareness of the designer's task. It follows then that the design manager should have a design background, preferably with industrial experience, and must be capable of marketing the expertise of his team (as well as the CAD system) to designers within the industry. The appointment of such a person to manage the design team must be strongly recommended.

Although the two designers are now quite competent in handling the computer system, they are distinctly lacking in industrial experience, and it must be recommended that they should each spend some time working alongside mill designers for several weeks.

It seems particularly sad that the three year period of waiting for the design system to be installed was not used to better advantage in terms of giving the designers practical experience, and must raise the question of why the time was not used more effectively.

It is also particularly worrying that the senior of the two designers (and the most competent on the system) has had her contract with BTRA extended for only six months, whilst others have been extended for three years. Reasons for such actions by BTRA are not mine to question, but they can only create a de-moralising and unsettling effect on the most competent and promising member of the group, and losing her at this stage would be such an unforgiveable setback to the establishment of a successful design service that I feel it is in UNIDO's interests that I draw attention to the matter. It is essential to create stability in the unit and rebuild confidence, and this must be one of the first functions of a Design Manager.

The shortcomings of the unit at BTRA were accentuated by a visit to the CAD unit of the Wool Research Association. Here the project leader and her two assistants worked very much as a team sharing credit, and with a sense of combined purpose. They have already developed their own software for woven fabric design and for printed textiles (the latter being vector based - see Appendix 2.), and although further work requires to be done on these, the results to date are highly commendable, and their design facilities have already been used by industry. Inevitably one must wonder why the Design Service for industry was not established there, where expertise and industrial contacts already existed, but whatever the reasons might be, there is little doubt that some form of collaboration between the two units must be to mutual advantage and to the benefit of this project.

7. SOFTWARE DEVELOPMENT AT BTRA.

Suggestions that BTRA might enhance the current weave software by writing further software routines themselves must be treated as totally impractical. Without access to CDI's original source code (which they are most unlikely to make available) it is not possible to interface new software with their existing program. In short, if BTRA wish to develop better software, they must write their own package IN TOTAL, including yarn design and colouring, warp and weft pattern generation, weave structure via drafting and pegging, screen simulation of the resultant fabric generated from this data, plus full storage and retrieval facilities for each of these relevant components. To write such a program, to a level only comparable to the existing software, represents several man-years by experienced graphics programmers. BTRA staff are not experienced programmers, and their knowledge and experience of practical woven design is limited.

Any attempt to develop such software (apart from rendering the existing software redundant) must dilute the time the staff can spend on developing a service for industry and becoming a financially viable unit.

8. RECOMMENDATIONS.

To establish a sound Design Service for the textile industry of India at BTRA, the following requirements are recommended.

8.1. To make a success of this project it is essential to appoint a Design Service Manager, who must have a design background in printed textiles (and a knowledge of weaving would help), preferably with some industrial experience, and who must be capable of communicating with designers in industry and of winning their confidence, and leading and inspiring a team of creative designers and marketing their expertise.

8.2. The Design Manager should produce a professional marketing plan, outlining the areas of service that can be offered, with lists of potential users with contact names, methods of establishing contact (mail shots, phone calls, appointments), methods of generating and maintaining interest in using the service. The design service should be offered to fabric users as well as fabric manufacturers - eg: merchants and clothing manufacturers, and it is recommended that discussions be held with Wool Research Association to see if some degree of collaboration might be established.

8.3. A display book should be compiled using printouts to illustrate step-by-step the processes involved in developing, manipulating, or recolouring a design. Such a book, with ten or a dozen examples, if taken to prospective clients helps to provide a positive idea in the client's mind of what the

system can do for him.

8.4. An accurate costing of the service must be established, based on monthly costs of salaries, overheads, and consumeables, and an hourly charge calculated for design services, based on an intelligent assessment of the hours of commission work likely to be achieved in a month. The latter figure should be practical rather than optimistic, and the final costing should be adjusted by any level of subsidy being offered by BTRA or the Indian Government. (Note: Overheads should include monthly costs for Accomodation, Electric Power, Telephone, Travel, Equipment Maintenance and Servicing, Equipment Depreciation, Other chargeable administration services from BTRA.)

8.5. A suitable budget should be allocated and start-up funds made available to cover day-to-day consumeables, so that these can be easily maintained without the need for item by item accountability to BTRA. (The fact that I was denied personal use of ONE floppy disc on the basis that they were all accountable strikes me as reflecting a completely misguided attitude to the meaning of consumeables .... they get consumed.)

Costing for consumeables should include floppy discs, paper, pens, paints, printer paper and ink-rolls, plotter pens, film for Dunn camera and processing charges. An initial capital outlay should also be made to cover costs of establishing a collection of reference material (books of illustrations - see Recommendation 7), plus a design library (discs, albums - see Recommendation 8), and to enable improvements to be made to the studio environment (pin- boarding, furniture - see

Recommendation 6). This injection of working capital by BTRA is essential to put the Design Service on a proper commercial footing, and must be seen as a mark of confidence by BTRA in their ability to make valuable use of the extensive facilities provided by UNDP.

8.6. The design environment at BTRA must be improved. The front office, with its five brown desks, is more reminiscent of an old-fashioned schoolroom than a modern design studio. Yet this is the first impression gained by prospective clients. These offices should reflect the creative activity being carried out, with liberal quantities of printouts, drawings, and source material covering the walls (using pin-board panels). It must be an environment for GENERATING ideas, with paper, squared paper, pencils, pens, paints all readily available, and there should be a suitably large table for design ideas to be laid out, discussed and worked upon. Designers bringing their problems to BTRA must feel assured that the answers can be found here, otherwise they will not come back.

8.7. A comprehensive collection of source material should be on shelves in the studio, books of illustrations of flowers, leaves, butterflies, architecture, paintings, advertising, traditional motifs of India and other countries. Designers can not work in a vacuum.

8.8. Work should start immediately on building an extensive design library on a series of floppy discs or video discs, suitably catalogued into design styles (eg: floral, geometric, abstracts, photographic, traditional themes), and printouts of these mounted in a corresponding set of albums.

The printouts and disc-files should be fully cross-referenced, so that any illustration from the albums can be quickly located on disc, and put on the screen. Designs generated from scanned images should be colour-compressed before storing, and the number of colours indicated by showing colour blocks below the image. With an extensive library of these designs on disc it should be possible to encourage clients to select ideas from these, rather than scanning new designs into the system, as the time taken to compress and retouch (essential before they can be re-coloured) is much too great to be carried out in front of the client.

8.9. It is strongly recommended that the design service should be initially confined to Printed textiles, as the current software for Woven textiles is inadequate to meet industrial needs (see Appendix 4 - Limitations of Woven Fabric software). It is also recommended that CDI be asked to give some indication of committment to improving the Weaving software together with a probable time scale. Only when this is known can any assessment be made of the potential value of the BTRA system to the woven fabric industry of India.

8.10. It is recommended that when the Dunn camera has been installed some trials should be carried out, enlarging a 10"x8" film image of a black separation for printed textiles, both with and without anti-aliasing, in order to assess the limits of enlargement that are acceptable. The tests should be repeated on 5"x4" film, and assessment should be based on actual screen printing of the images on to fabric. Tests should also be carried out to find a practical method of aligning scanned images accurately for horizontals and verticals -

otherwise they will not join properly.

8.11. It is recommended that the two BTRA designers acquire some practical industrial experience, by making arrangements for them to work alongside mill designers for a few weeks. You do not become a designer of woven fabrics by simply reading Watson (the definitive text-book on fabric structures). It is particularly disappointing that this practical experience was not arranged during the three-year waiting period.

8.12. It must be accepted by BTRA that it is not practical to interface new modules of software, which they might write themselves, with the existing CDI software, and that such effort will simply dilute the main task of supplying a design service.

8.13. Progress at BTRA should be reviewed by UNIDO in the next six months, and if satisfactory then arrangements should be made for any outstanding visits by experts. This may entail extending the project by a further twelve months. Satisfactory progress should be measured in terms of actual work undertaken successfully for industry.

8.14. An acceptable measure of industrial success should be achieved with the current equipment before considering further additions (eg: Garment design.)

APPENDIX 1. 24-BIT AND 8-BIT GRAPHICS.

The graphics display in both the Iris and the PC systems is based on 24-bits. In essence this means that each point or pixel on the screen display is held in memory as a specification of its colour. 24 bits are used (or 3 bytes), with one byte each specifying the Red, Green, and Blue content of the colour. A screen image containing 3/4 million pixels will require three bytes of memory per pixel, or 2.25 million bytes of memory, and as the colour of each pixel is defined individually, every pixel can be a different colour. The advantages of such a system are found when photographic images are scannned into the computer, as there is no practical limit to the number of colours that can be used in replicating the original photograph on screen. Similarly, full three-dimensional modelling of objects with lighting, shading, and texturing (as used in animation sequences for Television or Video) also demand the colour range provided by a 24-bit system.

The disadvantage of such a system is that it is not possible to directly change a colour globally throughout the image, as every pixel has its own colour data specified individually. Thus if a fabric in red and blue is scanned into the computer, and the designer wishes to change the red to brown, it can not be done directly. The image must first be converted to a Colour-Map mode, where each pixel is allocated a colour NUMBER, and the Red/Green/Blue data for each colour number is stored in a separate Colour Table. Pixels of identical colour will be allocated the same colour number. Now by changing the RGB values of any given colour number, every pixel with that same colour number will be changed instantly.

8-bit graphics systems use only one byte (8 bits) per

pixel, and store a single number in the range of 0 to 255 for each pixel, and this colour number is then referred to the Colour Table for the relevant RGB values. This means that only 256 different colours can be displayed on the screen at any one time; however, all the pixels of a given colour can be changed instantly by simply altering the RGB values in the table.

APPENDIX 2. PRINTING LARGE DESIGNS.

The image seen on a graphics screen is composed of a series of individual dots or pixels, with 1024 dots across the image and 768 rows of dots vertically (in the case of the CDI system). The density of these dots is 72 per inch (although this will vary with different sizes of monitor.) Such images are described as Bit-mapped images, and at normal viewing size, whether printed or viewed on screen, the individual dots are too small to be visible, and the image will be acceptable as the basis for screen printing.

If however the printout has to be enlarged (normally by Repro camera) prior to printing, then the dots are also enlarged, and the image begins to show the familiar "jaggy" edges, which may render it unacceptable for printing. Large designs reproduced at smaller scale on screen may look fine, but when enlarged to the size required for printing there may be a noticeable lack of fineness of detail together with the blockiness of enlarged pixels.

The Dunn camera uses a special high resolution monitor, rendering the pixel dots even finer, and thus reducing the problem, but it is to be recommended that BTRA undertake some trials on receipt of the camera to assess the degree of enlargement that can be achieved without degradation of the image. The tests should be done with and without anti-aliasing, a technique which diffuses the edges by adding an intermediate shade; the success of this on a black-on-white image will depend on how the sensitised screen used for printing reacts to the mid-grey edging tone generated by the anti-aliasing process.

The Big-Image option provided by CDI attempts to handle this problem, allowing the full-size image to be made up of several single screens, with facilities to edit the joins. In terms of applying this in practice to a large design there are still a lot of difficulties to be overcome (see Appendix 3. Using Big Image), and the option does not provide a simple solution.

In other fields, such as Engineering, the problem of creating large designs on a small screen is generally overcome by using Vector graphics rather than bit-mapped. Vector graphics uses point-to-point plotting, storing the image as a series of coordinates (the end points of straight lines, or curve-drawing data). Although the screen image is still represented as a bit-mapped image, by outputting the coordinate data to a pen plotter (rather than sending the screen image to a printer) the result is a smoothly drawn image, with non-jaggy lines, which can be scaled up or down effortlessly.

Vector drawn images are normally confined to line-drawing, with cross-hatching to represent solid areas, and do not permit the variety of brush types and textures obtainable with bit-mapped images. They are however particularly useful for duplicating motifs, rotating and rescaling them, and for large-scale designs with fine detail they provide much superior output. It has still to be ascertained whether software for linking the digitising table and the plotter will accomodate these features, as this has still to be supplied by CDI.

APPENDIX 3. USING BIG IMAGE.

In general principle the Big Image facility appears to offer an easy solution to handling large designs, but in practice there are still a number of problems. The function allows multiple "screenfulls" of images to be built into one large image, with a viewing window which allows the centre joins to be examined. In practical terms it is just as important to examine how the OUTER edges join, and - although the window can certainly be positioned to do this - the result can only be assessed with any accuracy if the individual images TOTALLY fill the screen; otherwise, if joined in the middle, there will be gaps where the outer edges should meet, making it impossible to assess the joins at these adges.

The joining of adjacent components of one multiple image is not made any easier by the fact that the scanned image always leaves one black line at each edge of the screen, so that this two-pixel wide gap must be filled, either manually or by moving each image by a tiny amount. This latter action has a knock-on effect if there are more than two parts to the image.

There is also no facility for ACCURATELY placing the component images on each screen in relation to one another, to ensure continuity of a design, something which makes the use of this facility rather daunting for tackling originals too large for a single scanned input.

It must also be borne in mind that output from the Big Image must still be as separate printouts from each screen, with the need for extreme accuracy and care in joining these, particularly in the case of separations for screen-printing.

APPENDIX 4. LIMITATIONS OF WOVEN FABRIC SOFTWARE.

1) Currently no output of fabric production details, although this is shown in the software specification.

2) Only permits design of single fabrics, with no facilities for blankets and colourways.

3) Fabric displays are shown at a fixed setting, regardless of the setting requested under "Construction".

4) Inability to handle yarns of different thickness in the same display.

5) No facility to group yarns into qualities or counts, or fabrics into separate files.

6) Colour adjustment, by RGB or HVS, is done without visual reference to the colour being altered; the result is only seen when the option is terminated ! This makes any attempt at accurate colour-matching on screen virtually impossible. The concept appears to be that screen colour is irrelevant, and matching is done only to printer output, an approach few designers would agree with.

7) Matching output colour of the hard copy to a library of printer colours has to be done for each colour EVERY time it is required; there is no facility for storing library data.

8) No simulation of fabric finishing.

Fabric simulations are generated under two headings "Fabrics" and "Weaves", and the method used for each is different, which makes the system confusing. These also differ between the PC and the Iris.

"FABRICS" Version.

a) Patterns are created by specifying the number of "Blocks" of colour in warp and fill, modifying their sizes, and colouring them from a palette, and then applying weaves to EACH block. This is a totally unnatural way for any designer of woven fabrics to approach the task.

b) Screen display is always at 72 ends & picks per inch, regardless of setting specified.

c) Colours can only be selected from the palette, but these colours - if specially related to yarns - can not be stored individually with names and specification for future use. Only the palette, modified as need be, can be stored.

d) It is not possible to use yarns generated under the "Threads" option; these can only be applied via the "Weave" heading.

e) Weaves have to be loaded from file and applied to each block in the warp, even if the block consists of only one thread. This is fiddly in complex designs, as omitting to apply the weave to any one block throws the continuity of the weave out of sequence. (This is overcome on the Iris, but not on the PC, by allowing the weave to be applied over a range of blocks.) Totally impractical weaves can be generated in this way, with no reference to harness requirements, and it

will be interesting to see how drafting of the result is handled when the production ticket is available.

f) The Fillscreen option simply copies the repeat, based on the size of the colour layout. If this does not equate with the size of the weave repeat (or a multiple of it) the resultant screen representation will not be an accurate rendering of the result in cloth.

"WEAVES" Version.

a) Based on selecting a yarn colour from the "Threads" file and applying to a warp or weft grid. There is no indication of thread number when moving over the pattern (OK on the Iris), and there is no bracketing or pattern repeat function. For a full screen display every thread must be coloured individually.

b) Screen display is always at 24 ends & picks per inch, regardless of the setting specified.

c) No facility to make Fill as Warp.

d) When selecting yarns from a file listing, there is no visual guide to the colour or style of the yarn until it has been selected.

e) Yarns created under the "Technical" specification (twists, and Slubs) can not be selected or applied.

APPENDIX 5. PROBLEM AREAS FOR PRINTED TEXTILES.

1) Absence of a versatile Zoom option (Iris only, OK on the PC).

2) Inability to switch to, and remain in 8-bit Colour-Map mode) for easier global colour manipulation.

3) Absence of vector-drawing to permit scaled images without jaggies. (May be included in software still to be delivered.)

4) Problems likely to be encountered in recolouring scannned images, particularly where delicate colouring is involved. Considerable handwork is likely to be needed.

5) Problems likely to be encountered in the accurate alignment of scanned images.

6) Problems likely to be encountered in linking Big-Image components with accuracy, and in matching outer edge joins, if images do not exactly fill the screen.