

Strategies for the effective use of computer and communications technologies in Art & Design

Directed to:

- * Heads of Art & Design departments
- * IT specialists in Art & Design
- * Lecturing staff in Art & Design

Of interest to:

- * Senior managers within HEIs
- * IT specialists within HEIs
- * Advisors and decision makers within Higher Education

Author

Colin Beardon (University of Plymouth)

Support

This study has been supported by the JISC Advisory Group on Computer Graphics (AGOCG). While the author has made every attempt to represent the views of the people interviewed, any errors or omissions are his sole responsibility.

Acknowledgements

This report would not have been possible without the positive contributions of many people who agreed to be interviewed and to contribute comments on earlier drafts. In particular, the author wishes to thank people from the following organisations:

Coventry University

CTI Art & Design (University of Brighton)

Dartington College of Arts

Falmouth College of Arts

JANET National User Group

JISC Advisory Group on Computer Graphics

JISC Information Strategies Coordinator
Middlesex University
Ravensbourne College of Design & Communication
Royal College of Art
University of Central Lancashire
University College London
University College Wales, Newport
University of Plymouth
University of Westminster

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Appendix 1 Summary of recommendations

0 Executive Summary

0.1.1 The CHEAD *Information Technology Survey* (1995) focused on the numbers of computers in art & design units within HEIs and quantified a perceived shortage of equipment.

0.1.2 This report is an attempt to assess the situation at the end of 1996 and to discuss strategic options for the next three to five years, based upon interviews in sample HEIs.

0.1.3 It describes the specific features of art & design education relevant to this report.

0.1.4 It recognises an increasing trend towards greater integration, harmonisation and collaboration in society at large and HE in particular.

0.1.5 It summarises the roles assigned artists and designers in both the *Technology Foresight* programme and the *Info 2000* Programme.

0.1.6 It notes a number of new projects located in art & design units which have emanated from the funding councils since 1995.

0.1.7 It finds that since 1995 there has been a further decline in capital funding for computer technology in art & design.

0.1.8 It finds little motivation for developing modules using the technology because of a lack of suitable computers for students to use.

0.1.9 It finds that a majority of institutions had completed the installation of network cabling for art & design staff and IT teaching areas, but not all institutions had done so.

0.1.10 It finds that the provision of network data points is often a separate exercise from the provision of workstations and there is typically little coordination between these two activities.

0.1.11 It finds that, on average, the provision of networking to the desktop is best within specialist colleges. Within universities, it is better if the art & design unit is located on the same site as central computing services or the computer science department.

0.1.12 It finds that a number of university based units felt that they did not receive sufficient benefits from the centralised provision of computing and communication services in their institution.

0.1.13 It finds that information strategies are frequently seen by the art and design unit as an attempt to normalise art and design practices with the rest of the institution.

0.1.14 It finds a strong belief that, while employment opportunities in the European "media industries" are growing, art and design students in the UK are falling behind some countries with respect to the provision of appropriate computing and communications facilities.

0.1.15 It finds that having technical/professional computing positions accountable to the head of art and design was the most significant factor in implementing an effective strategy for computing and communications in art & design.

0.1.16 It finds that research funding continues to be difficult to obtain for artists and designers and the positive contribution they could make to interdisciplinary research is not recognised.

0.1.17 It finds that there are opportunities for funding in Europe, but UK art & design institutions are poorly prepared to take advantage of them.

0.1.18 It includes 8 recommendations for institutions who wish to develop strategies for the efficient and effective use of computer and communications technologies in art & design.

1 Preliminaries

1.1 Relationship to CHEAD Survey

1.1.1 In September 1995, the Conference for Higher Education in Art & Design (CHEAD) published *Information Technology Survey*. The report, based upon 48 questionnaire responses and 12 management interviews, focused mainly on the deficit of IT equipment for staff and students in art and design, but also addressed issues such as technical support and staff development. It described what it perceived to be an anomaly in the equipment funding model for art and design and estimated a total shortfall across the sector of 1,972 standard art and design computers and 527 high performance art and design computers. It costed the value of this shortfall at £52.8 million.

1.1.2 This report attempts to build upon that work by reviewing the current state of computing in art and design, describing the strategic issues that institutions perceive with respect to the next three to five years, and suggesting ways forward for art & design units in the difficult situation of growing expectations and falling units of resource.

1.1.3 This report is based upon twenty interviews that took place during visits to eleven HEIs during September - December 1996. The sample was chosen to include as many different types of institution as possible. Interviews were conducted with managerial, teaching, technical and IT professional staff. The interviews were semi-structured around a set of topics, some of which arose from the CHEAD report while others concerned future problems and possibilities.

1.1.4 This is a more qualitative report than the CHEAD *Survey* and its main purpose is to articulate and analyse the problems perceived by the sector so that there may be more debate and actions can be taken. The main body of the report is divided into three main sections covering: changes in the context since 1995, a description of the situation as described in the institutions visited, and strategic issues which need to be considered by individual HEIs.

1.1.5 Two drafts of the report were produced. The first was circulated to eight people and the second to twelve. Among the twenty reviewers some of the people interviewed, some other people in art & design previously unassociated with the project and some people in leading organisations concerned with the development of related strategies (though not themselves involved in art & design). Their many comments and insights provided both a consensus of support for the main contents of the report and many detailed amendments which have greatly strengthened its presentation.

1.2 The nature of art & design

1.2.1 "Art & Design" is used throughout this report to describe a range of sub-disciplines which historically have included painting, sculpture, printmaking, photography, graphic design, typography, illustration, fashion and textiles, product design, furniture, metalwork, ceramics, glassware, jewellery and performance arts, but which also includes the more contemporary media arts such as video, television,

film, animation and multimedia. At various points sub-disciplines of art & design merge into related disciplines such as engineering design, interior design, landscape and architectural design, theatre, dance and music studies and human-computer interface design.

1.2.2 There is an expectation that, in contrast to the recent past, the HE sector will adopt an increasing trend towards integration, harmonisation and collaboration and that this trend will be manifest at institutional, national and European levels. Within such a context it is critical for art and design units to have a clear sense of the particular valuable contributions they can make within a larger picture. Some of the more important features that, in the context of this report, distinguish art and design educational practices from those of other disciplines are as follows.

(a) Learning in art & design is principally about developing understanding through activity and the development of skills, unlike many other disciplines in which understanding is achieved through the acquisition of knowledge.

(b) Art and design students learn predominantly through an iterative process of making products and critically reviewing them.

(c) Art & design education accepts a diversity of individual performances (i.e. different students can produce radically different solutions). In many other disciplines there is an expectation of a convergence of student performance towards a single solution.

(d) The control of tools is integral to the practice of artists and designers. The educational process provides a thorough practical knowledge of tools, not least because many new products are the result of an innovative use of tools.

(e) Most working and learning takes place through activity in a studio or workshop, rather than in a lecture theatre.

(f) Research in art and design is an integral part of creative practice and embodies appropriate methodologies which are not necessarily shared by any other discipline.

1.2.3 There is no single source for statistics on the numbers of art and design units and students. The CHEAD survey reported that there were 69,906 full-time equivalent students in UK ASC 10 (Art, Design & Performing Arts) in 1994 based upon funding council figures. Using UCAS figures for 1996, there are currently 68,952 art and design students undertaking degree courses in 154 institutions, and a further 11,619 students undertaking HND courses in 82 institutions.

1.2.4 Art and design is taught both within "specialist colleges" (i.e. colleges which teach only sub-disciplines from the list in section 1.2.1), and within "universities" (i.e. institutions which teach many other disciplines). Within the latter group art and design is taught predominantly within the 'new' universities, but is present in university sector colleges and some 'old' universities.

1.2.5 The term "art and design unit" is used in the report to refer to any unit that is responsible for this subject area. Depending upon the institution, this may be the whole institution, a particular faculty or a department within a faculty.

2 Changing contexts

2.0.1 Changes that have taken place since the publication of the *CHEAD Survey* are reviewed as they provide the background to this report.

2.1 Art & Design Education

2.1.1 Art and design practice plays an essential role in national well-being. Those students with an art and design education find employment not only as traditional artists and designers but also within a wide range of occupations and increasingly in the new media and computing industries. Both nationally and internationally, artists and designers make significant contributions to the economy, to the creation of employment and to enriching cultural life.

2.1.2 The *Technology Foresight* programme recognises this within the UK when it describes the significant role that artists and designers will play with respect to the UK economy. It says,

" .. it must not be assumed that producing more technical skills alone is the key to economic growth. Design and performance across a range of areas such as fashion, music, TV, video games and film are essential to the economy."

The point is amplified in the CVCP position paper on the case for a new Humanities and Arts Research Council,

"Art and design underpins a range of industries which collectively form a major UK sector with very large global markets"

"Humanities and arts subjects underpin those activities which sustain, stimulate and transmit the cultural life of the nation."

2.1.3 Within the EU, the *Info 2000 Programme* views the multimedia content industry as crucial for the European economy and European society. It estimates that this industry had a turnover of 150 billion Ecu and employed over 2 million people in the EU in 1994. It describes the positive role to be played by artists and designers in terms of employment, improving the competitiveness of the European economy, and developing Europe's cultural identity and linguistic diversity. It says,

"... content-related activities cover a whole chain whereby value is added during the various steps in the process from source material to end-user".

It sees the crucial participants as those involved in the creation of source material in the form of images, text, graphics, music, and sound, and it specifically names photographers, designers, actors, directors, musicians, and animators.

2.1.4 Though there are opportunities clearly spelled out in these documents, stereotypical attitudes still exist: e.g. that artists and designers do not need new technologies, that they are not economically significant and that their work is marginal to the national interest.

2.2 Higher Education in the UK

2.2.1 In recent years art and design, along with all other areas of higher education in the UK, has experienced acute problems with a declining level of resource per student coupled with particularly severe restrictions on capital funding. The CHEAD survey called for recognition of the genuine needs of the art & design sector and since its publication there have been some initiatives. There have been a number of new projects which have emanated from the funding councils which have improved the situation in parts of the sector. The formation of a new CTI Centre in Art & Design, projects funded under the JTAP Programme, projects funded under the eLib programme and the continuing support of AGOCC for developments such as CADE have all been welcomed. There have been initiatives, particularly within specialist colleges, that have supported networking. However important these projects are, the worsening general situation in many institutions means that the crisis described in 1995 is still with us.

2.2.2 Quality assessment, both through Teaching Quality Assessments and the Research Assessment Exercise have had their effect as agents of change within HEIs as increasingly the provision and use of new technologies becomes a quality assessment issue, even though resources are often not immediately at hand to meet the expectations.

2.2.3 Whether or not there will be any long-term changes with respect to the funding or role of these technologies in higher education as a result of the National Committee of Inquiry into Higher Education (the Dearing Committee) is unknown. Information technology has been identified as a central issue in many submissions. Issues that have been raised in the context of teaching and learning include: whether IT can reduce the cost of delivering courses; whether computer and communications technologies can enable institutions to offer more flexible education packages; whether they can facilitate more sharing of resources between HEIs and whether the costs of IT developments should continue to be borne solely by institutions.

2.3 Changing Technologies

2.3.1 The CHEAD report in 1995 highlighted the rapid growth of multimedia and the opportunities and demands it placed upon departments. The report drew a distinction between two types of computer, which it called a "standard art and design computer (SADC)" costing around £5,000 for hardware and software, and a "high performance art and design computer (HPADC)" costing around £25,000 for hardware and software. It argued that the average desirable level of general provision was 1 SADC for every 8 full-time equivalent students (ftes), and 1 HPADC per 50 ftes.

2.3.2 The situation with respect to multimedia workstations has not changed significantly. The costs have varied but not by much (SADCs are slightly more expensive, HPADCs are slightly less) and a serious shortfall persists.

2.3.3 The extension of the Joint Academic Network (JANET) into the art and design sector has opened it up to facilities such as electronic mail, electronic information services and the world wide web. The past twelve months have seen a large number of art and design units coming on-line and the implications of this are only just being felt. Networking, it is now realised, is more than the provision of another new technology, it is a radically different kind of computing environment that can lead to new forms of administration, new opportunities to access information in the public domain, a new medium within which to produce artefacts and new possibilities for collaboration. While some aspects of these developments build upon the similarities between art & design and other disciplines, other aspects necessitate the identification of what is distinctive.

3 Empirical Findings

3.0.1 The previous section describes the general changes that made it desirable to look again at the sector. This section records the situation as described in the institutions visited with respect to the provision, arrangement, supervision and funding of equipment.

3.0.2 Perhaps the most important introductory point to be made is that there are many individuals, at all levels, within art & design in HE who are very enthusiastic about the future uses of digital technologies and who work extremely hard under unfavourable conditions to enable students and their peers to share their vision. A recent report to the JANET National User Group on the Art & Design Community also identified this.

"The notable finding was the enthusiasm of the people to whom I spoke. They were full of ideas for projects, teaching plans and methods for communicating their art and ideas to the world."

3.1 Computers & software

3.1.1 Given that the anticipated lifetime of systems is around three years, every unit felt that the present funding situation raised very serious problems both in the short and the long term. With increasing "efficiency gains" being demanded, the scope for funding new equipment or replacing outdated equipment was disappearing, if it had not already disappeared. The likely future scenario, in most cases, was a static stock of ageing hardware running outdated software unless some new initiatives could be found.

3.1.2 Many units reported that the quantity of workstations at their disposal is below the minimum level at which new material can be developed and integrated seriously into teaching. Put more simply, there is no point in developing modules around the technology because there are not enough computers for the students to use. The reality, therefore, is that most students receive a very basic introduction to the use of computers but very few are able to progress beyond this level to make its use an integral part of their work. The exceptions to this were units which had successfully argued for new courses in a sub-discipline of multimedia and new equipment had been specially funded by the institution.

3.1.3 The vast majority of computer workstations (i.e. SADCs) seen on visits were supplied by Apple Macintosh and the company's products are still favoured by the vast majority of artist and designers. Several institutions had a pool of IBM PC equipment, but not a large number of IBM PCs were being used in teaching (except in certain areas such 3D modelling and animation). There were very few Unix workstations (i.e. HPADCs) and these were usually restricted to postgraduate students and staff.

3.1.4 Most institutions have created a variety of clustered pooled facilities based upon different levels of functionality. At the low-performance end there are pools for word processing and similar text based operations only. These typically use compact Macintosh machines (many over five years old) and machines in the LC range. At the higher-performance end most institutions provide a number of multimedia authoring workstations, each with a range of image processing, sound processing and editing software. Most institutions also provide medium-performance pool rooms catering for topics such as graphic design and publishing.

3.1.5 The policy in many institutions is to only purchase machines suitable for multimedia authoring with the intention to relocate any machines thus displaced to lower-performance pool rooms. A basic multimedia workstation for multimedia typically requires 32 - 40 Mb of memory, 1 or 2 Gb hard disk, a facility for large volume off-line storage, and a range of image processing, sound processing and multimedia editing software. Such a workstation currently costs around £5,000 - £6,500, the costs split evenly between hardware and software. Ironically, while the cost of processing power is declining, the memory and processing speed required by most new software is increasing even faster, hence the cost of usable equipment is still rising. The cost of such workstations is nearly always borne by the unit from its own funds. The exceptions are where special project funding is obtained from within the institution (which had happened in two of the sites visited).

3.1.6 The provision of computers on staff desks is extremely uneven for a number of reasons. With limited resources, providing student pool rooms is usually given priority over the provision of machines for staff. There are also reasons associated with the different culture of art and design professions. It is impossible for a lot of artists and designers to undertake professional or research work in their offices. They need to use studios, workshops or rehearsal rooms which they often privately maintain away from the college premises: a dilemma therefore exists between their using the computer for administrative work or using it for creative work.

3.1.7 Within some universities, the IBM PC is the machine that is generally recommended within the institution for purchase and is the only machine that is centrally supported. IBM PCs are also more commonly used by administrative staff, including those in art and design who often have to use this equipment in order to maintain compatibility with institutional systems. When this happens their equipment is no longer compatible with that used by the academic staff they work with.

3.1.8 There were particular problems expressed concerning access to high-quality input/output devices. High-resolution and large-sized scanners, gesture-based input devices, 3D scanners, high-quality printers, data projectors, 3D prototyping, and high-quality video output were all mentioned as desirable resources, yet usually beyond the budget of any particular institution to acquire. Some units suggested that such equipment might be shared between institutions within a region.

3.2 Networks

3.2.1 The majority of institutions had completed the installation of network cabling for the art & design areas (usually within the previous 12 months). In only two institutions visited was this not complete. Priority for the provision of network outlet sockets was, typically (in descending order):

1. administration and academic managers
2. libraries
3. student pool areas
4. teaching staff offices
5. workshops and studios

A typical ratio for the provision of network outlets was 1 outlet per 5 ftes, though much more generous provision was found in a few institutions.

3.2.2 Particularly within universities, the provision of network outlets is often a separate exercise from the provision of workstations to connect to these outlets, the latter usually involving a different budget holder. There is typically very little coordination between these two activities and, because of the continuing deficit in the provision of workstations, network capacity can be provided but not initially used.

3.2.3 By the nature of the material used in art and design (high resolution images, video clips, audio recordings, etc.), students and staff regularly handle larger file sizes than many other disciplines. This gives rise to particular problems. For example, the need for a storage strategy which will decide the responsibility the institution accepts for file storage, and the kinds of mass storage media the institution will support.

3.2.4 The bandwidth that is available to the art & design unit is made up of three components:

(a) Within the art & design area

The bandwidth within the art and design unit is typically 10 Mb/sec.

(b) Within the university

Where the art and design unit is located on the same site as the computer centre the link to the rest of the university usually operates at between 100 - 200 Mb/sec. Where the art and design unit is a remote site the bandwidth can drop to 64K b/sec in some cases, but 2 Mb/sec is now common and there are several plans for upgrades to 34 Mb/sec or higher.

(c) To the outside world

Links to the outside world are typically between 2 and 34 Mb/sec.

3.2.5 On average, the provision of networking to the desktop was found to be significantly better within specialist colleges than within the universities (though the latter do vary considerably). This may be explained, in part, by a number of recent funding council initiatives to address the needs of these colleges. Within universities, networking was found to be significantly better if the art & design unit was located on the same site as either central computing services or the computer science department. Art and design units located in remote sites (which many are) had relatively poor networking but this is probably true of all remote sites. The technology which has the potential to overcome the problems associated with geographical distance has too frequently been implemented in a manner that has exacerbated them.

3.3 Funding issues

3.3.1 The CHEAD survey presented an argument that the equipment funding formula was outdated and disadvantaged art and design as a discipline. Though this problem persists, it was not raised as a major issue mainly because of the general decline in capital funding which has led to reduced equipment funding. Several units received no capital funding allocation during 1995/96, leading to almost no new equipment purchases.

3.3.2 A number of university based units felt that they did not receive significant benefits from the centralised provision of computing and communication services in their institution. Some institutions had adopted an Information Strategy which, they felt, did not take into account the views of art and design. It was suggested that managers of art and design units have been particularly poor at articulating their case with respect to such strategies, but the counter view was also expressed that institutional managers have not been particularly interested in accommodating what they see as complex and expensive demands. As a result, institutional strategies are frequently seen by the art and design unit as a crude attempt to normalise art and design practices with the rest of the institution.

3.3.3 Cases were quoted where "top-slicing" led to facilities which meet the needs of most of the rest of the university but not the art and design students, whose needs were expected to be met from the funds of the art & design unit. For example, where institution-wide pool rooms are established art and design students find the machines underpowered, without the necessary peripherals and containing inappropriate software. A further example would be centrally funded maintenance contracts which cover only IBM PC equipment and do not cover Apple Macintosh equipment which is used predominantly in art and design.

3.3.4 Several units had tried hard to acquire equipment through means other than their own institutional funds. The following approaches were known to be proceeding, though their respective costs and benefits have not yet been evaluated:

- (a) donations of second-hand equipment by leading industrial companies;
- (b) costs partially recovered through revenue raised by short courses or selling computer time commercially;
- (c) equipment acquired as the result of a successful bid for a funding council supported project;
- (d) equipment acquired as the result of a successful bid for EC funds;

Though examples of all of these were found they were at a relatively low level when compared to the scale of the shortfall.

3.3.5 No institution visited had declared a formal policy on students acquiring their own computers but it was known that some institutions have included a statement in certain course documents to the effect that students are expected to have their own access to appropriate computing equipment. In reality, a number of students who were keen to use the computer as a medium for their work have acquired their own equipment and this sometimes leads to their attending college less. In general, this was not yet considered a major issue and institutions still operate within the assumption that they would attempt to provide whatever computing and communication equipment their students needed.

3.3.6 There is a strong feeling in many institutions that, while employment opportunities in the European "media industries" are growing, art and design students in the UK are falling behind some countries with respect to the provision of appropriate computing and communications facilities.

3.4 Technical & professional support

3.4.1 In specialist colleges there were usually a number of technical or professional support staff who were accountable to the college and this system seems to work well. In universities there was usually a centralised computing service which took responsibility for the provision of networking and various professional and technical services.

3.4.2 The biggest variable, in the universities, was the extent and quality of the technical and professional advice that was available to the art and design faculty. This may be in the form of art and design technicians who had taken on new responsibilities, IT professional staff recruited especially for the purpose, or art & design staff who had taken on this responsibility. The situation varied from a complete absence of such people to a unit with six people within a devolved structure. The experience of several institutions was that having technical/professional computing positions accountable to the head of art and design was the most significant factor in implementing a distinctive and successful strategy for computing and communications that addressed the genuine needs of art and design.

3.4.2 In those units where there is no technologically literate person accountable to the head of art and design, or in times past when no such person existed, there tends to be a low level of communication, sympathy and trust between the art and design unit and central computing services.

3.5 Research funding

3.5.1 Particularly since the Research Assessment Exercise in 1992, in which many art and design units were able to participate for the first time, there has been a growing awareness of the significance of research funding in relation to technological developments. One of the possible side-effects of research funding is that the host department gains equipment and expertise which can be used more widely.

3.5.2 Many units felt that, without a specific research council to apply to, research funding has been difficult to obtain for art and design. Research council bidding is highly competitive and is not designed to provide genuinely equal opportunities to disciplines outside of the main remit of the council concerned.

3.5.3 Until recently the research and development needs of art and design were seen to be catered for by funding projects that were essentially art history projects (e.g. the Teaching and Learning Technology Programme and Electronic Library projects). More recently art and design units have been successful in

bidding for development projects that relate more to their specific practices, (e.g. the CTI Art & Design and the JISC Technology Application Programme). These are not classified as "research" projects (in RAE terms) however and there is still no specific research funding for art & design.

3.5.4 There is a belief in some units that, particularly in the area of multimedia content, the main opportunities for funding lie in Europe rather than the UK. Unfortunately, UK art & design institutions are poorly prepared to take advantage of these opportunities. It is difficult for institutions to finance the bidding process within Europe, which is often supported in other countries within a nationally funded project. Because of the historical lack of funding, projects are taken from the UK to Europe which are not well developed. European funds usually meet only a proportion of the total cost of a project and anticipate support through national and/or institutional funding that is not easily found.

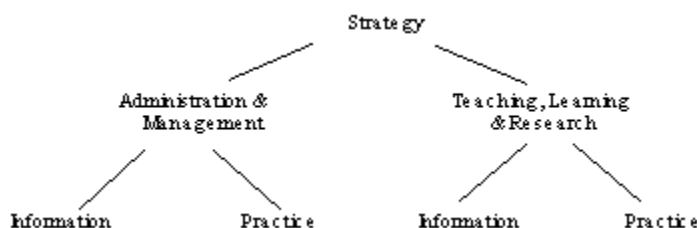
4 Strategic issues within Art & design units

4.0.1 In this section the author has attempted to bring together various threads in the report to provide a framework of issues which any unit should consider when attempting to develop a coherent strategy.

4.1 Information Strategies for Art & Design

4.1.1 Within the context of greater integration, harmonisation and collaboration it is important that art & design units articulate clearly their own strategy with respect to computer and communications technologies. There is certainly a strong belief outside the sector (and, to some extent, also within it) that art & design has been particularly poor at promoting its interests in wider forums. Whatever the reasons for this may be, it is not a criticism which can be ignored and this report is mainly directed to ways in which this weakness may be overcome.

4.1.2 A strategy for computer and communication technologies in relation to art and design must encompass both the viewpoint of administration & management, and the viewpoint of teaching, learning, & research. Within each of these areas there are different issues concerned with "information" and "practice".



Within this diagram each of the four terminal nodes raise a different set of issues:

- administration & management information: e.g. *what data is held, who is responsible for it, and who can access it?*
- administration & management practice: e.g. *how are matters discussed and decisions taken?*
- teaching, learning & research information: e.g. *what texts, images, etc. are available to students and staff?*
- teaching, learning & research practice: e.g. *what new methods are available for producing work?*

4.1.3 Most institutions (within the UK) discuss computer and communications technologies within the framework of an "information" or "information technology" (IT) strategy. Adopting this approach accentuates issues concerned with information and obscures issues surrounding practice. This is a problem for everyone, but it is a particular problem for art & design because of the prominent position that specific practices play within teaching, learning and research. These practices tend to be sidelined when there is a strong centralised push towards developing an Information Strategy of the kind recommended by the funding councils.

4.1.4 By focusing on information attention is drawn to the common attributes of computer use (data is coded in a certain way, it is kept in files and folders or directories, it is stored on disks and tapes and transmitted over networks). From an institutional perspective it is natural to concentrate upon information because it provides a common set of concepts across all disciplines and leads to controlled discussion and simple strategy documents. Unfortunately such an approach can be too simplistic and will fail if it ignores the relationship of information to practice. For the reasons outlined above, it is likely to fail most seriously in art and design.

Recommendation 1: Art & design units need to develop a local strategy with respect to computing and communication technologies, based upon their sense of the essential nature of art & design education and within the context of their wider objectives. When developing such a strategy particular attention should be given to the support of art & design practices as well as the dissemination of information. Units within larger institutions should promote their strategy within the context of any institutional strategy.

4.2 Administration and Management

4.2.1 Most institutions have clear policies with regard to what information is kept, who is responsible for maintaining it and who may have access to it. What is a lot less clear is the complex of legal and regulatory restrictions relating to digitised data. All data will be subject to laws covering libel, privacy (e.g. the Data Protection Act), obscene publications, etc. There are also many issues surrounding intellectual property rights (e.g. copyright law) which need to be specifically interpreted in the context of multimedia. There are also legal issues with regard to world-wide web (www) servers which may contain official information about courses, fees, etc. and which may be legally enforceable. There are also regulations covering the use of networks (particularly JANET) which restrict certain types of use. Work from art and design units in particular may be in conflict with some of these regulations. Most units seem aware of these issues in general but would welcome more information and advice.

4.2.2 Networking applications, such as email and access to centralised records systems, can make life simpler or make it more complex, depending on how they are integrated into practice. Implemented badly they will lead to problems such as information overload and fragmentation of decision making. If it is done well they will simplify the administrative duties of staff and lead to more effective decision making. Evidence from other subject areas suggests that in some departments where all staff are regular users of email, discussions can take place via the email system prior to formal meetings which can then be held less frequently and with greater effect. This relies upon all staff having and using their email accounts on a daily basis and there are a number of problems in achieving this. It can, however, be introduced for specific groups and extended as conditions permit.

Recommendation 2: Art & design units should initiate and support collaborative projects to collect information and provide guidance on the legal and regulatory aspects of material held on computers and should make this available to the sector. Units should also investigate ways in which electronic communication systems could enable them to reduce dependence on physical meetings and facilitate more discussion and less paperwork.

4.3 Teaching and Learning

4.3.1 While there are a number of projects to make relevant electronic images and text available either via CD-ROM or Internet, there is little evidence that this has had much impact on teaching in art & design. This is partly because staff are unwilling to make it an integral part of a course when there is a lack of usable equipment located in the right place. There is also a degree of scepticism among staff concerning the quality of images compared to traditional photographic and printing technologies. However, it does seem to be the case that many students are using the www, particularly in the theory or discourse related aspects of courses, and it would be useful if more data on this type of activity could be collected and shared.

4.3.2 There are also decisions to be taken concerning the location at which electronic information services should be delivered. Frequently they are located within a traditional library, but this can give rise to problems of access and in relation to existing regulations (for example, the loan policy for CD-ROMs). It has also been argued that the information should be made available first in the workshop or studio. A further view is that institutions should plan an extended intranet which would provide such information on demand and through which students can access the data anywhere within the institution or from their home.

4.3.3 A large number of issues were raised with respect to the relationship between art & design practices and art & design education. Computer pool rooms look different from other workshops and studios. The equipment is usually located on desktops with little space for other work, with no consideration for the immediate environment (e.g. the provision of pinboards) and little opportunity for group collaboration or review. This makes traditional teaching methods (such as critical review) difficult to carry out.

4.3.4 Most tools within art & design workshops and studios are under the control of students who act under the supervision of technical and academic staff. This relationship to tools is central to the culture of much of art & design. The computer originates from a different culture where it is presented as "infrastructure" and subject to centralised management and control. Given the ease with which computers can now be assembled, maintained and extended by their owners there is no longer the need for such centralised control. Responsibility for the equipment can easily be devolved to the art & design unit, to staff within the unit or even to individual students as the various practices demand.

4.3.5 As students and staff acquire equipment of their own they will wish to use this in conjunction with equipment owned and managed by the institution. Currently, in many institutions, this is discouraged if not prohibited. In the longer term sensible strategies of shared responsibility for provision will need to be developed in institutions.

4.3.6 Many units provide a common first year module which aims to provide all students with sufficient skills so that subsequent modules can expect them to be reasonably self-sufficient with respect to using the equipment and learning the basics of new software packages. Such a module suggests that there should be declared levels of competence for students and staff, both generic across all sub-disciplines and subject specific. There is also potential here for greater efficiencies of staff time but this is often dependent upon customised teaching rooms, with a special tutor's workstation networked to a significant number of students' workstations and projection and amplification facilities.

4.3.6 Many units are moving, or have moved, towards a modular course structure and there is a degree of uncertainty about the future extent of modularisation. It is likely that courses will, in future, have to be far more accessible with respect to presenting information about themselves and, where relevant, providing content-related material on demand to students. While such academic developments should not be technology driven, there are technological implications of such schemes.

Recommendation 3: Art & design units should consider the location, configuration and environment around computers so that traditional teaching and learning practices can take place.

Units should consider the need for a common first year module teaching generic technical skills with relation to digital technologies. This could be extended to a wider consideration of the relationship of communication technologies to student centred learning and modularity.

Units should develop strategies so that responsibility for the purchase, installation, and maintenance of computers resides with those who use them in practice. These strategies need to allow for the integration of equipment owned by students and staff

4.4 Research

4.4.1 A lot of attention is focused on the relationship of research to teaching, particularly within the 'new' universities. In practice, research projects often set their own agendas and have their own tightly prescribed set of objectives and deadlines. In many cases there is no clear link between their immediate outcomes and undergraduate teaching. This is not to say that they do not have a beneficial indirect impact on teaching through increased technical expertise, the dissemination of new ideas and awareness of technological change.

4.4.2 Art and design units have historically been isolated for a number of reasons: their origins as specialist colleges, their physical locations, their different methodologies and, some might say, their chosen isolationism. Their move into the higher education sector occurred at a time when competition was paramount and this has exacerbated the isolation of some units. It is now possible to begin to overcome this historical legacy: to look forward to a period of collaboration in which barriers are falling and the role of art and design, in collaboration with other disciplines, is recognised as crucial to national development. A reliable communications network that links individuals and workplaces in all colleges is central to this development but so is a willingness to work closely with other disciplines.

4.4.3 The integration of art and design into specific research programmes that are intellectually challenging is of paramount importance. With respect to multimedia and networked services in general, there is a definable need for more funded research and development projects that aim to deliver the multimedia content described in the *Foresight* and *Info 2000* programmes. Such projects need to combine the design and practical skills found in art and design with the technological skills found in computer science and engineering and the human studies skills found in psychology and the social sciences.

4.4.4 The majority of information technology-based products are unattractive, difficult to understand and difficult to use, and they are thereby limited in their commercial success. The usability of multimedia systems is a topic that science and technology has been unable to address satisfactorily within its own disciplines. Artists and designers have a distinctive approach which is oriented towards usable finished

products and which can overcome the limitations of other more formal methods. A genuine combination, not just of the skills that each partner can bring to bear but of the methods that each partner adopts, could be particularly fruitful.

Recommendation 4: Art & design units should endeavour to bring to the attention of those research councils which have responsibility for funding computing and communications research the very important contribution that artists and designers can make to these fields, and should explore mechanisms whereby this potential might be better realised.

4.5 Equipment

4.5.1 The art & design sector is fully aware of how serious the problem is with respect to the provision of computer terminals to staff and students. Any estimates of the shortfall, as against some ideal model of provision, is certain to throw up a huge deficit for which there is no easy remedy. Every institution will have to face the fact that in order to develop any kind of purchasing policy, expectations will have to be curtailed, certain areas will have to be given priority and every opportunity to acquire equipment other than through internal funds explored.

4.5.2 Art and design units need to develop realistic policies on the provision of computers for staff. With the increasing importance of networking, and the fact that some benefits can only be achieved if staff regularly use their computers for communication, there is an institutional need for staff to have easy access to networked computers in their office and/or through external links to where they do their work.

4.5.3 At present there is strong adherence to Apple Macintosh equipment in all areas of art & design. Such equipment is relatively expensive and, for some purposes, may not perform as well as some competitors. Particularly in a time of scarce capital resources, alternative suppliers should be considered.

4.5.4 Stronger and better cases could be made to funding authorities, at all levels, to improve the amount of funding flowing to art and design for computer equipment. Such arguments at present suffer from a lack of comparative information and the sector must help itself by cooperating on the collection of authoritative data.

4.5.5 There is evidence that the future of capital funding is bleak. Institutions should be aware that, though there are some opportunities to acquire equipment other than through institutional funding, there are no known examples where these have had a significant effect on the deficit. Few institutions have yet considered what it would mean to look to the private sector for large scale equipment support (though some have) yet this topic will have to be confronted in any realistic strategy.

Recommendation 5: Art and design units need to develop policies on the provision of computers for staff, particularly with respect to part-time staff and technicians. The policy needs to give guidance on where equipment allocated to staff should be kept and the expectation for staff to be network accessible. Units should review any explicit or implicit policy of adherence to a single supplier.

Units should initiate and support projects to collect more data concerning numbers and funding of equipment in art and design units and make this available to the sector and should develop positive strategies to try to attract external funding to provide computer equipment.

4.6 Networks

4.6.1 The Joint Academic Network (JANET) links institutions. The distribution of that network within a particular institution is seen as an internal matter for the institution concerned (as is the distribution of any capital funds). For lecturers and students within art & design such distinctions are arbitrary. The network for them is as good as the service it provides to their desktop. In many cases it provides no service at all (either because they have no computer or no network connection point) and in many other cases it operates at very slow speeds (either because their own connection is slow or because the network within the other unit is slow).

4.6.2 An effective network would enable planning, not as 154 separate colleges teaching art & design, but as a nation-wide sector. Within this sector, institutions that had particular expertise could offer services to the entire sector, rather than just their own students, and could in return draw upon the expertise of other institutions in other sub-disciplines. However, art & design units lack the confidence in the infrastructure to make such a concept central to their planning. One of the major reasons contributing to this attitude is the split of responsibility between funding councils and institutions.

4.6.3 There needs to be a degree of collective development if the benefits of networking are to flow. It would be preferable to have a nationally coordinated plan to develop the network both within and between institutions but, in its absence, art and design units could act more decisively to ensure that the sector is properly served. Large discrepancies in extension of the network and its capacity are very inefficient because it is impossible to capitalise on developments when the provision of service is uneven. National guidelines on desirable minimum network standards for art and design units is the only sensible way to progress.

4.6.4 For example, it could be argued that all institutions in the sector should attempt, by 1 January 1998, to provide a minimum service so that still images can be delivered on demand from any art & design unit in the UK to any staff desk or teaching space in any other unit, at any time of the day. It has been suggested that an effective bandwidth of 2 Mb/sec right through to each desktop would be required to achieve this.

4.6.5 A guideline of this kind would be a first step, with a built-in progression so that short video and audio files are deliverable on demand by 1 January 1999. To achieve this it has been suggested that a minimum bandwidth of 20 Mb/sec would be required to each desktop.

4.6.6 There needs to be opportunities for units to develop specific on-line resource centres in subject specialisations. It is unlikely that these would follow the information-based learning approaches adopted in the TLTP programme, for example. The intention would be for these centres to develop useful material to support teaching and learning practices in art and design in conjunction with subject specialists throughout the UK. The projects will need to be properly evaluated so that the true costs and benefits can be identified. The CTIAD would play a central role in coordinating these developments at the national level.

4.6.7 It is still not possible, in practice, to distribute files easily around the network as there are so many different file formats and different compression and conversion software is used by different mail systems. Though this is a general problem, art & design units need to be aware that this could become an obstacle to greater collaboration if the issue is not addressed locally.

Recommendation 6: Art & design units should collaborate to decide upon a desirable national minimum level of network provision and maximum pressure should be exerted within institutions for this to be achieved.

Units should endeavour to persuade the funding councils to continue to support projects to develop and disseminate subject specific materials for art and design.

4.7 Professional support

4.7.1 For reasons indicated above, art and design units need to pay extra attention to developing and articulating their strategies with respect to the use of computer and communications technologies. In developing their own strategy and in negotiating within larger institutional contexts, there is a need for experienced IT professionals who not only understand art & design, but who are sympathetic to its aims and methods and who are trusted by art & design staff. Experience has shown that these conditions only exist where there are professional staff accountable to the art & design unit. Those units within the university sector may need to negotiate with their centralised computing agency in order to exercise the greater autonomy they need.

Recommendation 7: Institutions should endeavour to ensure that there are technical and/or professional staff with experience of computers and communications that are accountable to the head of art and design.

4.8 Art & Design community

4.8.1 The art & design community within higher education needs to recognise that many of the issues covered in this report are best dealt with collaboratively and that the spirit of competition, which is still strong both between institutions and between art & design and other disciplines, is an obstacle to progress within a more integrated world. The support of individuals and units for collaborative and national initiatives is very important if the case for art & design is to be better presented both locally and nationally.

4.8.2 There is a need for better quantitative information on what happens to art & design graduates and more qualitative information on how an art and design education addresses such national issues as employment, the economy, social cohesion and cultural diversity.

4.8.3 The support of the art & design community outside higher education (involving such bodies as the Arts Council, the Design Council, employers of graduates, suppliers of equipment, etc.) is crucial in many ways. There is also a need for a closer dialogue between the sector and units within it and this wider community to ensure that they contribute to the financial viability of educational programmes in art & design that involve computer and communications technologies.

Recommendation 8: Art & design units should support and encourage national initiatives to improve the status and funding of the entire sector. The sector should attempt to persuade appropriate bodies (e.g. the Arts Council, the Design Council, the Crafts Council, regional arts bodies, the Humanities Research Board & the ESRC) to support research into the national contributions made by art & design and its graduates. Art & design units need to initiate a dialogue with the wider art & design community concerning the latter's material support for technological infrastructures.

Appendix 1 List of recommendations

1: Information Strategy

Art & design units need to develop a local strategy with respect to computing and communication technologies, based upon their sense of the essential nature of art & design education and within the context of their wider objectives. When developing such a strategy particular attention should be given to the support of art & design practices as well as the dissemination of information. Units within larger institutions should promote their strategy within the context of any institutional strategy.

2 : Administration & Management

Art & design units should initiate and support collaborative projects to collect information and provide guidance on the legal and regulatory aspects of material held on computers and should make this available to the sector. Units should also investigate ways in which electronic communication systems could enable them to reduce dependence on physical meetings and facilitate more discussion and less paperwork.

3: Teaching & Learning

Art & design units should consider the location, configuration and environment around computers so that traditional teaching and learning practices can take place.

Units should consider the need for a common first year module teaching generic technical skills with relation to digital technologies. This could be extended to a wider consideration of the relationship of communication technologies to student centred learning and modularity.

Units should develop strategies so that responsibility for the purchase, installation, and maintenance of computers resides with those who use them in practice. These strategies need to allow for the integration of equipment owned by students and staff

4: Research

Art & design units should endeavour to bring to the attention of those research councils which have responsibility for funding computing and communications research the very important contribution that artists and designers can make to these fields, and should explore mechanisms whereby this potential might be better realised.

5: Computing equipment

Art and design units need to develop policies on the provision of computers for staff, particularly with respect to part-time staff and technicians. The policy needs to give guidance on where equipment allocated to staff should be kept and the expectation for staff to be network accessible. Units should review any explicit or implicit policy of adherence to a single supplier.

Units should initiate and support projects to collect more data concerning numbers and funding of equipment in art and design units and make this available to the sector and should develop positive strategies to try to attract external funding to provide computer equipment.

6: Networks

Art & design units should collaborate to decide upon a desirable national minimum level of network provision and maximum pressure should be exerted within institutions for this to be achieved.

Units should endeavour to persuade the funding councils to continue to support projects to develop and disseminate subject specific materials for art and design.

7: Professional support

Institutions should endeavour to ensure that there are technical and/or professional staff with experience of computers and communications that are accountable to the head of art and design.

8: Art & design community

Art & design units should support and encourage national initiatives to improve the status and funding of the entire sector. The sector should attempt to persuade appropriate bodies (e.g. the Arts Council, the Design Council, the Crafts Council, regional arts bodies, the Humanities Research Board & the ESRC) to support research into the national contributions made by art & design and its graduates. Art & design units need to initiate a dialogue with the wider art & design community concerning the latter's material support for technological infrastructures.

Address for correspondence with the author:

Professor Colin Beardon

Exeter School of Arts & Design,

University of Plymouth,

Earl Richards Road North,

Exeter EX2 6AS

Tel/Fax 01392 645028

c.beardon@plym.ac.uk