

CIRCUS For Beginners

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0. Abstract

This paper describes CIRCUS, (Content Integrated Research For Creative User Systems) is an ESPRIT Working Group, its origins, its main concerns, and a high-level view of some of its conclusions. One of the main issues was the way in which topics with their origins in the internationally misunderstood idea of 'culture' tended to predominate. While we take the view that our idea of culture is indivisible there are nonetheless subcultures, which seem to understand their own niches but little else, within it. Much of the head-butting in our deliberations came from this source. One source of cultural clashing which some observers tended to minimise was that between practice-based disciplines and knowledge-based disciplines. A good example was the distinction between the practice-based art and design community on the one hand and the more knowledge-based computer technology community (who nonetheless do a lot of practice-based work in their training) and we point to examples of clashes between these.

We make a particular example of the rise of the subculture which surrounds music technology, a new discipline within an old arts-and-humanities one. While there is plenty of evidence for the persistence of culture we also show that a careless spreading of carrots for starving donkeys can have unexpected cultural consequences. Music technology, which is more like computer science than, say, musicology, is now more likely to be found in engineering and computer science departments than in music departments despite the fact that it is a classical practice-oriented discipline with more structural similarities to design than computer science. The explanation is entirely to be found in the unexpected consequences of the way in which the subject is funded.

A major concern of CIRCUS has been the topic of 'creative pull' which is our favoured method of developing relevant technology for use by arts-based practitioners. Briefly 'creative pull' involves the development of relevant technology for furthering a creative practice-based project, so artists are in control and technologists derive their necessary insights from creative need rather their own overheated imaginings. We give some detail as to how 'creative pull' could be used to progress topics like nonphotorealistic rendering which have so far been driven largely by technological agendas. Finally after a bit of iconoclasm we develop some recommendations which could go into our final recommendations to the Commission, specifically in terms of mechanisms for promoting and supporting projects with a 'creative pull' core, which are notoriously difficult to put together and get past the Commission's refereeing processes intact. Finally we discuss the vertical market model and show that many creative projects, particularly film projects, can effectively define an entire market for goods branded by the original film. These include pedagogical aids and knowledge packaged as a commodity, which in turn generates its own issues. A coher-

ent model of creative pull can this have a quiet significant effect on geographically localised cultures and help to internationalise them. We argue in conclusion for a body to maintain a watching brief on 'creative pull' and to refine it from practical examples.

1. Origins

CIRCUS (Content Integrated Research For Creative User Systems) is an ESPRIT Working Group, originally set up in 1988 as one of the very last additional actions in Framework 4, under DG III. Its purpose was to develop models for collaborative work between artists (the term here used in its widest sense) and technologists (ditto) and to promote these models by whatever means available. While some have criticised this aim as implicitly promoting a 1950s agenda of building bridges across C.P. Snow's 'two cultures', there is no such intention here, rather that technology, particularly computer and communications technology (ICT), is irresistibly intruding into what is normally thought of as creative work (and so practised by artists) and that, like any new technique, this has to be understood by its potential practitioners in terms of its true strengths and limitations. The specific problem that computer technology poses is that it is in principle malleable to such an extent that the limitations on its form and functionality are still barely understood, yet the people charged with the task of making the technology available have little or no understanding of the needs of creative users. What the artist usually sees is a tool which is in principle capable of being harnessed to creative ends but in practice resists being so applied. Quite often the tool is shaped more by blind economic forces than by a clear response to a specific, here creative, need.

CIRCUS came into existence as a forum in which both artists and technologists could work out how best to play to the strengths of ICT and how to apply both creative and technological solutions (possibly both together) to its limitations. In particular the then new Framework V programme invited projects in such areas as new media but required them to be addressed in essentially the same old way, by technologists working towards commercialisation. The only obvious exception to this was in the area of cultural heritage which, incidentally, CIRCUS was also capable of reviewing. The scope for effective participation by artists was thus limited by an essentially technological agenda although everybody at the time, the participants of CIRCUS and programme managers in DG III, believed that we could do far better than this, and to develop new models of working which could inform the nature of Framework VI or even the later stages of F V. It is fair to say that everyone involved was excited by the idea of doing something quite new (and iconoclastic), not least the

expanding of the expertise base on which future Frameworks could draw.

It is also fair to say that, while not ultimately wholly original, the CIRCUS agenda was an ambitious one and the WG has had a chequered history peppered with misunderstandings perpetrated by the very people who might have thought would give the WG their strongest support. The CIRCUS idea has been aired before, specifically at the University of Illinois at Urbana-Champaign, the MIT Media Lab (and its imitators), and a recent IEEE forum. However a near total change in participation, fuelled by natural migration and a switch to DG XIII, has resulted in the CIRCUS agenda being restarted on at least one occasion and a fairly regular questioning of the principles on whose elucidation we are engaged. While this is no bad thing in principle, in practice we haven't learned anything new from these periodic bouts of self-examination other than a reinforcement of the values our goals. On the other hand it is evident that we have made progress and have moved on a long way from where we started. A recent experience of a workshop whose agenda appeared to be to form another version of CIRCUS, this time with an overwhelmingly technological (DG III) membership, demonstrates they have a CIRCUS-worth of work to do before they will have reached where we are now.

This paper aims to give its reader an understanding of where we have got to after nearly three years of deliberations within CIRCUS. We are currently engaged on the near impossible task of taking a reductionist approach to an essentially holistic activity, which is a probably unfair way of saying 'describing a culturally holistic pattern to a technological readership'. It is in reality an exercise in banging square pegs into round holes, but has the virtue of making the intangible graspable to an extent. We will proceed here by describing what we mean by culture and why we think it is important. In this we believe we are taking a EU-centric view, but it seems that the word 'culture' means different things to different people, so we must be clear. We then describe the sorts of interesting and useful questions where, while they require technological solutions, the answers would neither be understood by technologists in the necessary terms nor be posed by them in the first place. We then discuss means by which projects which could achieve these ends be structured, the mechanisms needed to support them, and the wider implications of structures to support creative activity which feeds technological development. Finally we discuss the role of the creative artist in a technological research context and the need for a body like CIRCUS to develop the agenda to the next stage. It is here that we will put to rest the final lessons we have learned in our 3 year journey around Europe.

2. Culture

Culture is a term which itself carries a different (cultural!) baggage depending on which European uses it. To a Briton the term usually conjures up what we should properly call cultural artefacts: music, literature, art, sculpture, also film, TV programmes and public media of all sorts, and basic assumptions about what we like (football, bangers and mash). Some more educated Britons might be aware that there was a long-running debate, now lost in time, about the 'two cultures' which referred to an essentially arts and humanities based culture versus an essentially science and technology based culture. There is an enormous amount of what even

Britons would recognise as snobbishness about all this, for e.g. the elevation of music over film in the earlier list and, more subtly, the separation of the intellectual cultures surrounding arts and science. C.P. Snow was the villain of the piece (a scientist, of course) and as you may remember he was a Cambridge don who spent a lot of his later life being savaged by another Cambridge don (F.R. Leavis) on the arts side (of course). Their spat even made it to the pages of 'Time' magazine and no doubt elsewhere in the 1960s and early 70s.

The reason it is all snobbery is because most people (now) recognise that the elevation of the University system (itself the embodiment of national cultures everywhere, and nowhere in England more than Cambridge which provides the UK with most of its 'establishment') has been due to Government support of scientific and technological research and probably would never have happened if Universities had failed to nurture the boom in hi-tech industries in respect of both the fruits of their research and the provision of the workforce to use them [Econ97]. While the arts provide us with most of the cultural things which give comfort to our lives no British Government would take the slightest interest unless there were big bucks in it for the economy over which they preside. (One could argue that this could indeed be the case for the systematic production of cultural artefacts but the economy is simply not geared up to exploit this.) Interestingly analyses of the perceptions of young people in Britain as to the social status of the various academic subjects put arts-based subjects at the top and the more mathematically rigorous subjects at the bottom. Engineering, in this pecking order, is the pits, and indeed many good Engineering departments around the UK are having great difficulty recruiting even a fraction of the students they attracted 20 years ago. More horrifically, something similar is happening in maths. So while the academic *raison d'être* might be science and technology nobody wants to study them (with Computer Science as a notable exception because students believe that you can get good jobs in CS – true – but think you don't have to know any maths to get there – false) and its impossible to recruit good researchers at the rates that Universities pay. There's always the odd lunatic though, and we're the ones who keep the system going - just about - so don't blame us when the economy goes down the tubes.

Our point is that Snow's position was really a political one, an attempt at establishing a different pecking order, with his profession, no doubt, at the top this time. Our position is different. We believe that our (European) culture is indivisible but finds its expression in many different ways. What is important is that every intellectual discipline has something to teach others but they often express what are essentially the same ideas in different ways. The analogy between computer programmes and knitting patterns has often been remarked on but how about computer game storyboards, musical scores, Jacquard Loom cards or statements in Church's Lambda calculus¹? The answer is that all of these very different cultural artefacts embody very similar ideas expressed in almost unrecognisably dissimilar terms. What we are trying to do in CIRCUS is to develop collaborative models

¹ A mathematical formalism which defines functions operationally but predates automatic computation

in which everybody is a first class contributor and this involves exploiting (understanding) what we all know and taking advantage of unique differences wherever possible. The outstanding obstacles have been language, definitions and discipline-specific conventions, and, it has to be said, the sub-cultures which surround these different disciplines. So we'd better get in with defining what we mean by culture as so far we've spent most of our time saying what it isn't.

What we mean by culture here are the tastes, preferences, skills, and accepted conventions of a self-perpetuating organisation of people. Research units, companies, universities, whole societies, all have their own cultures - all they have to be to develop their own culture is to have both a past and a future as a persistent and purposeful grouping of people. Details have been discussed extensively elsewhere [Pat99]. The point about culture is that all the evidence shows that, once established, it is remarkably persistent. Formal studies of measurable sociological indicators, such as that of the so-called 'democratic deficit' in Italy, point to a persistence in the value of those indicators over centuries, in some cases over 500 years. In recent times we have seen apparently intractable social problems driven by apparently irrational hatreds until one remembers that the *causus belli* is buried centuries in the past. It's the persistence of culture which makes the problems intractable, not logic or common sense (of which typically there is a notable absence). Here we are dealing with marginally more benign aspects of culture but always we have to reckon with its core characteristic of persistence.

In other countries like Germany the term culture carries with it slightly different baggage, again rooted in history. Germany as a unitary state is considerably less than 500 years old but from its foundation there has been a struggle between *Kultur*, the culture (as we understand it) of the East and *Cosmopolitanism*, the label given to the common culture of the West. In fact modern German history is incomprehensible to outsiders without understanding the nature of this struggle and the additional baggage that each version of German culture swept up with it in the late nineteenth and twentieth centuries. The end of the European wars in 1945 in effect put these differences back in the deep freeze and, only now with the collapse of Communism and the normalisation of the Eastern part of Germany, is the struggle resuming, fortunately somewhat muted through the extreme forces each strand has been subjected to in the meantime. For our purposes German cultural history doesn't offer us any useful lessons, other than demonstrating once again the persistence of culture and the only known methods of changing well-established cultural attitudes (very unpleasant ones, as Stalin demonstrated 1930-1953). Since Stalinist methods are usually considered unacceptable we need to learn to work with culture rather than futilely struggle to change it.

What we face in CIRCUS is really a spectrum of cultural conventions which, while they make dialogue from opposite ends of the spectrum difficult (and characterised by discussions which have a strong tendency to diverge and get nowhere), can provide far greater rewards than from what one might describe as intradisciplinary discussions. Examples of the sorts of things which CIRCUS can be quite proud of include its promotion of technology-oriented working models which are actually driven by creative need ('creative pull'), its comparisons between different pedagogical models and their mediation by technological means, and its investigations into creative data-paths and their promotion (which is the

focus of the creative metadata discussions, vertical markets and open source models). This is by no means an exhaustive list and we would particularly point to several projects which have creative outputs or artefacts which are largely facilitated by technological means, including (again non-exclusively but notably) the collaboration between George Legrady and Timo Honkela ('Pockets full of memories'[Leg&00]) and several works by Malcolm LeGrice ('Chronos', 'The Cyclops Cycle'[LeG01]) all of which have been publicly exhibited.

As a consequence the idea that there might be cultural problems to be overcome has periodically been attacked within CIRCUS and elsewhere as being 'part of obsolete agendas' and it has been rather more subtly argued that the convergence of technologically-oriented and technologically-mediated media will, indeed, make the agenda obsolete within a generation. The real problem is that the proponents of these arguments have indeed made the agenda obsolete - for them (and us), but this isn't the case when the context is widened. Two examples come to mind, the DG III workshop alluded to earlier and the experience described in Fred Moody's book 'I Sing The Body Electronic'[Moo95]. Since this book may not be familiar to many readers we should say something about it.

The book describes the experience of an author (Fred Moody) who was allowed to record a year in the life of the Microsoft Multimedia Publishing Group. At the time (1993-4) multimedia publishing was an activity new to Microsoft and was carried out by a team made up out of designers (mainly from a creative arts background) supposedly collaborating with developers (all from a computer science background). There are many fascinating insights in this book but above all it emphasizes that the cultural integration we in CIRCUS take for granted simply doesn't exist, or maybe just evaporates, when developers and designers are thrown into a group willy-nilly and forced to come up with a product on a mainly impractical schedule determined by issues utterly unrelated to the needs of the product itself. Here the product was a children's encyclopaedia intended to be a stepping stone to Microsoft's (then) newly released Encarta encyclopaedia product. What made the schedule impractical was Gates' terror of what would happen to Microsoft's share price the instant their price/earnings ratio dropped below its then high mark-up. Essentially Microsoft was the victim of its own success². What made any 'cultural integration' disintegrate was the mutually unhelpful perceptions the two groups, designers and developers, had of each other. Moody constantly reminds us how young they all were (this mainly because he thinks they didn't have the experience they needed to manage their individual character flaws). In fact they were the very people whom it has been suggested would be culturally integrated because of their exposure to both ends of the cultural spectrum,

² Gates feared that shareholders would desert in droves resulting on a potentially disastrous run in share value as soon as its present markets saturated and its earnings growth levelled off. Given that Microsoft had achieved its dominant position through what are now known to be fairly rough tactics it was assumed that Microsoft would have to try to dominate the multimedia market, indeed all markets it entered, in the same way as it had for operating systems and office utilities. Anything less and it was curtains for the share price (most of Gates' fortune was held in Microsoft shares).

admittedly at the time a minority but so exposed by the professional paths they had chosen and the fact that Microsoft had picked them for that very reason, and here they are fighting it out just like Snow and Leavis 40 years earlier (albeit with less class).

Anybody who thinks that there isn't a cultural problem has either not been paying attention or has not been close enough to the metal to see it. We are sure Gates was quite unaware of it in his organisation. We in CIRCUS are aware of it in sometimes mysterious disagreements over apparently innocuous terms which carries additional baggage for one or other of our various groups, but the elucidations are illuminating and sometimes useful. What we still have to do is to understand that while peace may have broken out within our ranks the Wars are still being fought outside them and it is most unwise to think they are over, or even close to it.

3. A Culture With A View - Music Technology

The disciplines defining the foregoing descriptions of culture are fairly new. All of these disciplines seem to have one thing in common, and that is that they are not all the same thing, but more correctly truly interdisciplinary fields, such as music technology, digital cinematics, computer aided design, etc. It is this interdisciplinarity which makes it difficult for a common culture to emerge and jump over the barriers and borders of the more traditional cultures. These fields live in frameworks which are traditionally mono-disciplinary and thus lack the support needed to provide a positive environment for the development of these new areas of creativity.

3.1. The Fourth Generation Dilemma or Living With The Neighbors

We can take Music Technology as an example for one of these new interdisciplinary fields and Higher Education as an example of one of these frameworks in which they live. The discipline of Music Technology, if there is such a thing as a "single" discipline of that name, has already acquired a relatively long history, and is thus a good example for investigating how successful its integration has been into existing frameworks.

These degree curricula are of a multidisciplinary nature, but are still given as if they fit seamlessly into our traditional, discipline-based academic structure. Sometimes we, the lecturers, course developers and degree managers, forget that these are degrees which do not have a long standing tradition on which practices can be based, and that we are ourselves are still in the process of learning how to best facilitate the provision of these new degrees and integrate an interdisciplinary field into a disciplinary framework. This challenge exists on all levels of academic endeavour: from the running of these courses and its administrative frameworks, to the teaching and facilitation of learning, the disciplines' pedagogies and specific vocabularies, and its research with its own particular methodologies.

A more detailed view on this can be read in another paper of this conference: Carola Boehm, *Between Technology and Creativity, Challenges and Opportunities for Music Technology in Higher Education*.

What is possibly one of the biggest challenges existing for Music Technology, as for other interdisciplinary new technology based disciplines today, is that of its introduction into

affiliated Arts based, mono-disciplinary departments (Music Technology into Music Departments, for instance). This has created a so-called "Trojan Horse complex". The rising interest of music technology has been met by a general decline of financial support for arts-based subjects in the last decade or so, as Governments have followed their disbelief in the Arts' participation in the process of wealth creation to its logical conclusion. This has had the consequence that Music Technology within a Music department is perceived as resource-hungry: a costly but very popular activity - fed by the music industry's need for specialists in this area. This results in a situation in which many Music Departments have had to decrease the size of their total teaching body, but increase the number of staff active in music technology. With the ratio of "music technology staff to musicology staff" rising, intra-departmental long-term strategies might not be able to be formulated without conflicting interests and tensions arising from having to distribute a reducing budget. This is a perfect scenario for Academic jealousies to flourish and internecine warfare to kill the whole thing off³. (Does this sound familiar to anyone?)⁴

3.4. Funding The Wide View

Another set of complexities is added to the already existing problems of cultural practices in the differences in funding for different disciplines, and how this influences or challenges interdisciplinary cultural and creative practices. Here we look towards the EU for working funding models for the future, models which will not only support creative processes and tools to support these processes, but which support new and emerging creative cultural practices. Although this seems easy, there are many nuances of differences of funding for different disciplines, which have created a major different behaviour of different disciplines acquiring these funding resources, becoming a barrier to collaborative projects crossing the borders.

3.5. Maybe There's Another Way of Doing This?

It is recognised that although there is a new funding diversity for multidisciplinary technology based areas of activity, there are many holes in this supporting net of funding schemes and most of these are in the area of the creative arts. Science-oriented funding councils have gradually started to include arts-related development into their remit, if there is a technology based research aspect to the project. Taking music technology as an example, this provides a wide basis for targeting funding and, generally speaking, offers a higher chance of success in acquiring funding for specific projects or parts of specific projects, than in their monocultural parent discipline.

³ Often one or two technology based researchers have more research income than the rest of the department together, thus creating another potential for tensions and adding to the burgeoning "Trojan Horse Complex".

⁴ See also Carola Boehm, *Between Technology and Creativity, Challenges and Opportunities for Music Technology in Higher Education*, ICMC 2002 Conference Proceedings

On the other hand this new funding diversity hides the fact that it is fairly easy for funding bodies to duck proposals by using the argument that another funding council is responsible for the researcher's activities. The fact that funding councils do not generally collaborate in their funding calls implies difficulties for researchers who do. It is also difficult for funding councils to accept necessary emphasis on serendipity, and creative and exploratory approaches within the creative arts disciplines as valid fields of research. The generally unhelpful development of having "foolproof project plans" with deliverables spelled out to the detail of PhD thesis, have weakened not only creative arts research but also areas with similar working methodologies, such as basic research⁵.

The distortions induced by the application process can be seen as a natural barrier for the masses of interested applicants⁶. It severely disadvantages those who either are affiliated to smaller departments, as most of the creative arts departments are, or those who remain unaffiliated, such as is common among artists. Consequently, most larger interdisciplinary projects have either commercial or science based partners as the central coordinating or initiating instance with artistic presence sidelined or seen as a service to the project. Although it is to be welcomed that the numbers of these interdisciplinary collaborative projects is increasing, we are far from having "creative pull" established in the project structure itself, simply because smaller departments, such as most art-related departments are, do not have the critical size to suffer the burdens of weighty application and project management processes. This does not benefit our (wider) cultural evolution and it is obvious that this issue will need a rethinking of support structures and their requirements in order to provide a more fair funding environment for multidisciplinary activities and to enable the placement of "creative pull" in the centre of technological development.

To minimise distortions induced by the application process, one of the logical objectives for research active groups or individuals is to duck administration and focus on research time⁷, i.e. to apply for longer and bigger projects. This is sadly contrasted by the tendency of funding bodies to support a decreasing amount of long-term actions. Three-year R&D projects have become very rare, especially in areas of creativity, culture and education. Projects less than three years have the consequence that PhD students cannot be sought out for these projects and an influx of short-term contract research staff has become the norm. This, consequently, has its own problems, but especially in the arts, where there is not such a steady industry-supported flow of 3year PhD sponsorships, as in the science and engineering based disciplines.

A common source for such apparent short-termism is industry and the fashion for wanting fundamentally academic projects to be conducted in collaboration with industry. Would-be industrial collaborators complain that they can

never see more than 12 months ahead, let alone 3 years. This gets back to funding bodies and horizons shorten. It is an interesting issue to question whether industrial collaboration delivers the sorts of outcomes funding bodies desire. While both of us support the idea of industrial collaboration in principle (it is nice to see one's work being used let alone any rewards that might come out of it) in practice it is as exasperating a process for academics as it is for the industrialists themselves. It is rare in most fields for industrialists to want to collaborate over a specific piece of technology. Companies want to 'own' the technology they develop and one of the most frustrating things about industrial collaboration is seeing the technology which has been developed – usually successfully- being discarded rather than taken up. "Not invented here" is often blamed for this. The whole point of industrial collaborations is that the technology so developed does get taken up by industry but the reality on the ground is that the opposite happens. What industry really wants is access to high-quality graduates whom they may have selected through the collaboration or otherwise.

In fact there is quite another way to develop the sort of technology that industry would want to take up and that is through 'creative pull'. Generally speaking industry is aware of the technology it needs and if it doesn't have it or can't buy it will develop it itself, thus satisfying 'invented here' and 'ownership'. Government grants lower the threshold for the sort of technology a company might think of developing but equally encourages companies to allow themselves to be distracted from their core activities and in the end they decide they didn't want it after all. If relevant technology were to spring ready-formed in front of them from the start then they could take an immediate decision on relevance and buy it if needed but that in turns means the developers being clairvoyant – or being primed via a 'creative pull' project in which the relevant issues have been highlighted. No act of faith is then required. It is time to re-think the whole basis of industrial collaboration before funding bodies eventually realise they are wasting their money on what are, in the end, culture clashes.

3.6. How To Shape A Culture by Less(?) Stalinist Means – A Case History

Another issue of significance is the support for networking, including conferences, working groups and visiting artist/scientist programs. Few conferences have successfully accomplished a truly interdisciplinary nature with interdisciplinary attendance and interdisciplinary content. Although the interest in these is very high there are again different kinds of barriers to participation⁸, and the resultant mix shapes the evolution of community cultures in essentially unpredictable ways⁹.

It is interesting to note how the very different sources of, and emphases in, funding for the visual arts and design and those for, say, computer music have shaped developments in the different disciplines. Visual arts seem

⁵ ..and, it has to be said, much commercial research. Companies often complain that the kind of research they do has to be done quickly and often they can't predict where they'll be more than one year ahead.

⁶ This may be the intention

⁷ Richard Feynman was famous for this. He always loused up his administrative responsibilities and the word went out 'Feynman is irresponsible' and, after a while, his administrative load dropped away. But only someone with his academic reputation could get away with this.

⁸ One of the most obvious is of course the lack of support for unaffiliated artists to visit conferences. A not so obvious reason is the fact the type, source and amount of funding of, say, visual arts related conferences seems completely different than audio related arts.

⁹ We are reminded of the comment that reforms usually produce the exact opposite of what is intended.

to have no problem in lining up all manner of funding sources while computer music has been strictly a child of the academic community. Since Universities outside the USA rarely have any money of 'their own' this has resulted in an impoverished, sickly and isolated child. The visual arts seem to have plenty of means for subsidising networking while the computer music community struggles on local charity. This is underlined by the larger number of artists in the visual sector who can be independent and unaffiliated, also by the many conferences in visual media and the sole ICMC conference in Computer Music.

The cultural traditions of computer music (and following it audio/sound design) go back to a time where there was not much money for any arts, thus forming quite early in its history a more science based approach, a more academically slanted approach to computer music. This was where money was available: science based academia. In this community (computer music) the artists have felt, over a much longer time, pressure to affiliate themselves to certain academic or teaching institutions and this has shaped their culture. A casual (causal?) observation is that totally unaffiliated freelance composers seem to be much rarer than unaffiliated freelance designers and media artists.

In reality, artists in the computer music and sound design sector are quite used to going to conferences, and having to set up their installations or performing their pieces without any financial or other support. Only commissioned pieces are supported by registration fees or/and travel. Subsequently conferences which try to include other disciplines within the music technology area, are not too successful in this attempt, as they are normally traditionally run like normal science based conferences with differences in evening events, installations and concerts throughout the day. This format can discourage artists from the visual sector, in which academic culture is less evident than a more general artistic culture, influencing the structure of the conference itself¹⁰.

All this implies that whereas in the communities of media, film and design funding bodies or national cultural bodies are available to support the running of conferences, in computer music it is the universities which have taken up that role and are funding the processes of networking and dissemination. The major difference is in where the financial support comes from as this has shaped artistic cultures and will continue to do so. Although our aim might not be to try to even out these differences¹¹, these aspects of diversity within the whole creative arts sector should not be ignored but included in future considerations about funding models.

We tamper with cultures when we tamper with funding mechanisms. Beware of what you wish for. The fact that reforms often achieve the opposite of their intention is due to a failure to realise these comparatively subtle linkages. But then, Governments have never been subtle and rarely understand what the levers of power actually do when you pull them, unlike Stalin. Maybe his methods were more transparent.

4. A Model Project

A question we haven't faced is whether we need to worry about cultural mismatches at all. Maybe its quite OK for us to

hide away in our monocultural niches and produce wholly technological outcomes without benefit of creative input or vice versa. The result¹² will inevitably be that there are whole classes of problem we cannot tackle at all, let alone the more familiar issue of the rudderless development of technology for creative users which nearly always manage to solve problems creative people aren't really interested in solving. (Hence our interest in 'Creative Pull' as a mechanism for avoiding such essentially wasted activity.) The interesting problems are only exposed by listening and observing.

We can answer the question directly by positing the sorts of project which can only be handled effectively by a collaboration between artists and technologists¹³. It is possible to do lots of hand-waving here in an attempt to avoid looking partisan¹⁴ but the result is bound to be unconvincing. Instead we will show what effect a CIRCUS view point has on our particular lines of work, which mostly involve music although one of us is a Computer Scientist and the other an Engineer who works in Music (so is officially a Musician). Paradoxically the Computer Scientist is most interested in a project which involves interpreting Music and the Musician is most interested in Computer Science issues relating to cultural metadata (databases, information retrieval, networking).

One of our projects involves making a *Fantasia*-style animated film with six pieces of music interspersed with live-action sketches which in effect introduce the next animation[Pat98]. The music is all by one person, the Soviet-era composer Dmitri Shostakovich who, at various stages of his career, had been told by the Communist Party to make his music 'programmatic', so it could be more easily understood by the people. The famous cellist Mstislav Rostropovich is quoted as describing Shostakovich's music as not so much programmatic as telling 'a secret history of Russia', and this is the basis of our film's story. We see historic figures (Stalin, Beria etc.), all caught up in the story the music seems to describe, in such a way that it is likely that their antics would have been recorded by history just the way the record says (if we could figure out what *that* was). The story further endeavours to suggest a hitherto unacknowledged relationship between the pieces of music which have been chosen. One of these is the sequence *the Storming of the Zeelubky Heights* from the appalling Soviet propaganda film, *the Fall of Berlin*. Most of the other music is taken from Shostakovich's Tenth Symphony and indeed the theme of the film is that we are seeing the 'hidden' story in that symphony, which turns out to be a small slice of just such a 'secret history' as Rostropovich had in mind. The strand we are developing here is the relationship between the music of the Tenth symphony and that of *the Fall of*

¹² We were going to write 'unfortunately' here but there is nothing unfortunate about it. It is only 'unfortunate' for those who are die-hard stick-in-the-muds.

¹³ It could be argued that we could dispense with 'creative pull' within projects with explicitly technological goals on the grounds that sometimes such projects produce worthwhile products. However the history of technological development for creative users is littered with disasters resulting from the failure to consider creative input, so we don't recommend it. Here we are dealing with projects for which both creative and technological input is truly essential.

¹⁴ David Garcia puts it quite nicely as 'selling our own fish'

¹⁰ A practical demonstration of this is imminent.

¹¹ Given our comments about the persistence of cultures this may be difficult even if it were desirable

Berlin, or rather Op. 82a, Shostakovich's arrangement of the music from that film. The point is that, as part of developing this relationship we will be staging scenes in the animation to look like scenes from *the Fall of Berlin*, and other contemporary films which might support this idea.

This leads us on to a range of technical issues to do with the realisation of the 'look' and style of the piece. Since these are historical figures and since the film is mostly set in the Kremlin of the early 1950s we have lots of photographic data as to what the principal characters looked like (and how they moved and spoke) and what the set should look like (that is to say not exactly like the Kremlin of the 1990s, either inside or out). There is enough photographic data to construct reasonable facsimiles of the principal characters as computer-generated 3D models and to construct 3D models of the relevant parts of the Kremlin. These can all be rendered to photorealistic accuracy, although this would be both expensive and difficult to do. The argument here is that this would be unnecessary. The story also calls for wholly animated characters with action to take place at cartoon speeds with the exaggerated styles of that form. There is a whole strand of computer graphics devoted to non-photorealistic rendering (NPR or NPAR e.g. [Fek&00]) which starts from the basis of realistic modelling then rendering out using stylised effects. NPR is treated as a wholly technical subject albeit often contributed to by people who come from a more art-based discipline. It is thus a core CIRCUS subject involving both artistic and technical judgements to realise artefacts which employ NPR in their creation.

What the project seeks to develop is a style or look for individual scenes which may include 'traditional' drawn 'flat' animation, posed photorealistic models of the historical characters and 3D backgrounds determined from photogrammetric analysis of multiple views of the modern Kremlin (inside and out). There are a variety of possible solutions but they all have one characteristic in common, no elements should look out of place at any time. The nearest analogy would be with the film *Who Framed Roger Rabbit* where the producers used a cartoon style which suggested the 3D appearance of the characters by rendering out self-shadowing, and blended the photographic elements with the drawn elements by filtering them through an exaggerated yellow filter thus giving them a not wholly naturalistic look. Here we have to do something more complicated because, although we want to convince our audience that they are looking at the actual historical figures on screen, we also want them to behave in styles more consistent with cartoon characters than their real selves would.

The modern way of rendering out cartoon characters, typically depicted with flat colour within regions delimited by sharp black borders, is to filter the black border with a Raised Cosine (or Hanning) filter to 'scallop' the border and prevent it 'ringing' after passing through a DCT codec. This is best dealt with using computer-based rendering, which also facilitates 'pinning' shadows (partly transparent greys shaped to fit over part of the flat fill region) so *Roger Rabbit*-style shadowing (originally seen in the *Dan Dare* cartoons of the 1950s) has also become quite common. The historical characters may be modelled to a photorealistic standard¹⁵, but they can be subject to an analogous process which flattens out 3D shading and generates shadow overlays in the same style. Many post-war Soviet-era photographs have a similar

character and there are commercial processes which will produce cartoon-style drawings from photographic data but we want something in between something which is obviously a photograph and something which is obviously a drawing. While there are technological means of achieving the goals stated above, we just don't know at this stage what will look right and this will need an experimental bench on which it is possible to try out options quickly and easily (albeit perhaps impractically inefficient for final rendering). In the end such a bench would need to be both developed and used on the project so its nature would be shaped by its ultimate users, creative artists. This requires an intimate hands-on collaboration between creative artists and technologists, although the outcome may well be a wholly technological product, usable as such by other artists.

The remaining difficulty with 3D characters is that of animating them. A fully photorealistic model has to behave convincingly realistically and, although nobody has yet demonstrated convincing lipsynch with photorealistic human models we don't have to face this particular problem here. We would however have to have our fully photorealistic models behave the way our historical characters appear to on news footage. If we rendered out our characters as fully stylised 'flat' cartoon characters we would lose the link with their realistic origins but could animate them in familiar ways with cartoon effects and timings which would also be consistent with the cartoon characters around them. It turns out that intermediate positions on the scale between fully photorealistic and fully stylised allow for the acceptable of intermediate styles of animation, neither wholly real nor wholly stylised. What will determine how real or stylised our representation needs to be is precisely how stylistic our animation needs to be and precisely how far away from the fully stylised end of the scale we can occupy and still 'hold' our audience. This is a process which is wholly technological while the styles of animation are a wholly creative issue.

The third problem area concerns how to render out the backgrounds. Some background elements will be wholly drawn so have that flat 2D look, however mediated. Other elements will be provided from photoaccurate models which can be rendered out with photographic textures or an entire gamut of more stylistic textures which would progressively flatten out the background (although occlusions would be consistent with the 3D model). Having 3D or two-and-a-half D effects in backgrounds gives a more dramatic effect to animation as Disney has been doing with the multiplane camera since the late 1940s, and more recently with computer-generated 3D (but mostly fully stylised) backgrounds since *The Beauty and the Beast* (1990). Once again we have the possibility of generating fully photorealistic backgrounds or run the spectrum from photorealistic to fully stylised. Here the problem is different to the character representation problem because we can make the backgrounds behave like reality. More problematic is the fact that the 1950s Kremlin was not quite the same as the modern Kremlin so some changes to both model and textures will be needed. There is also the problem of capturing all the textures needed, which could be insuperable requiring that missing textures be synthesised. Again it is rarely possible to fill in holes in photographic textures to a quality one can get

¹⁵ again taking photogrammetric data from film footage and fitting conformable models to these

away with on a cinema screen so it would make sense to cultivate a deliberately synthetic look¹⁶. Here experience suggests that good photorealistic but fully synthetic backgrounds are quite acceptable with photographed characters in the foreground. However, with foreground elements of varying degrees of stylisation (and similarly constrained animation) it will be an artistic judgement as to where in the spectrum from realistic to stylised the backgrounds should be placed. Here a certain measure of inconsistency is possible (and indeed present in *Roger Rabbit* and *Gladiator*) so it becomes a wholly creative judgement once the necessary technological steps have been taken.

We can thus see that creative and technical issues are intimately intertwined in a context usually perceived as being wholly technological, yet where wholly technically based teams are bound to fail. Some of the technology they have to develop will only be known once the artists have made their judgements and these in turn are only possible because of previous technological developments. This in fact is the first example where progress can only be made by mixed teams.

5. Recommendations

In the end CIRCUS has to report, which means trying to find a coherent set of conclusions, and hopefully to make recommendations to the Commission in respect of the furtherance of the subject of the Working Group.

With such a culturally diverse group there is bound to be a degree of artificiality in any sense of cohesion that the group may want to project. Although we have argued elsewhere that the culture from which we are drawn is indivisible, and that perceptions of distinctiveness are themselves artificial constructs, there are clear subcultures which surface, for example, in respect to teaching. In fact teaching is one of the areas where the WG has focused on quite closely of late, as it is an area where our distinct subcultures can not only help each other but also contribute to each others' methodologies. Making sense of this requires a 'God's View' of what seem like quite distinct positions. Curiously there is a common theme to be pulled out here of practice-based training, which is a characteristic of vocationally-oriented pedagogy and which in turn characterises all our disciplines, creative and technological alike. In academic circles there is a lot of resistance to vocational training despite the fact that it underpins a lot of subjects which are routinely offered at academic level (medicine, accountancy, flavours of engineering, law, music, computer science) and the idea that artefacts can be offered as research outcomes is quite new. We will return to this later.

It is fair to say that it is only at the end of its life that CIRCUS has learned properly what it should have been doing all along. This is not meant as self-criticism, rather the lack of definition of the problem area as a consequence of institutional neglect. In essence CIRCUS, like Deep Thought in 'The Hitch-Hiker's Guide To the Galaxy', has had to work out what the question was first and, like the unknown question to whom the answer was famously 42, finding this is the harder task. The important point is that the Commission cannot expect an essentially divergent process (driven by natural divergers) to converge to a single solution (like 42). It is not

only questions and answers which have concerned CIRCUS but also, and more pertinently, the processes which lead to them, have had to be understood and built on. This is not something which CIRCUS will have the last word on. There is plenty of scope for a continuing WG tasked with refining the processes within which artists and technologists will collaborate effectively. This requires defining model projects whose outcomes include insights into the workings of these processes and identifying the support mechanisms which would make these projects viable. The fact that this is still perceived as a vacuum was the motivation behind the recent workshop at the IGD Fraunhofer which we have remarked on more than once already, although CIRCUS does have something to say on these topics and does so here, but we know these are not the last words on the subject by any manner of means. There is a lot of learning still to do and lessons still to be understood meantime, these last hopefully appearing as outcomes to the very projects we are talking about here. The Commission needs to consolidate what CIRCUS has started and accept that this will be an on-going process from which cranky noises will occasionally emerge.

One of the main topics such a body would need to look at is that of 'creative pull' itself. This is something that CIRCUS has not itself quite got on top of, mainly because we have no European examples of 'Creative Pull' projects to study. While funding bodies, even – amazingly – within the UK, have welcomed the idea of linking technology to creative development in the style of a practice-led subject, their referees have killed every project which attempted to use the creative pull model. There seems to be no pattern to this assassination, although it is fair to say that both authors of this paper have seen plenty of similar assassination in their own proposals whenever they went anywhere near the subject of 'media'¹⁷. One suspects prejudice originating in 'sour grapes', but the villain of the piece is far more likely to be internecine warfare between standards of inference in different arms of our supposedly (and generally) unitary culture. It is also a characteristic of whether there is 'enough' funding in the system, which addresses what monocultures think of as their core issues properly, as to whether referees will tolerate adventurous proposals which they may not quite 'get'. It is a characteristic of many of these rejections that the reasoning given, if offered at all, is quite disgraceful. 'Dishonest within the rules of the system' would be a fair phrase to use. The question of standards of inference is one we will be returning to in our conclusions. For whatever reason 'creative pull' is still waiting to be tried and referee prejudice is only one of a number of remaining hurdles we need to get over before we're going to get there, we suspect. When it is tried there will be the inevitable learning curve we cannot anticipate in the absence of actual experience. A new group charged with a CIRCUS-like agenda would need to be there to pick up this experience and shape it for the future.

Outside the problem of referee support, which can be managed, is that of the nature of the funding itself. We have argued already, and shown by example, exactly how an apparently irrelevant factor – the origins and accessibility of funding – can shape a whole culture. Since

¹⁶ We can extract colour from illumination on the photographic textures and use a synthetic illumination model of known characteristics. This has been done even on 'photographed' films like *Gladiator*.

¹⁷ This is quite a lot more conservative and traditional than creative pull projects, so is a quite depressing precedent.

cultures fossilize quickly and are virtually unshiftable (other than by mass extinctions) once set, the nature of funding mechanisms inevitably fall within our considerations. The substantial point here is that 'creative pull' projects have a creative practice project at their heart and these are usually funded by quite different mechanisms to technology projects. There is thus a measure of double jeopardy here where what is essentially one part of the project is judged according to one set of criteria and the other by quite different ones. While we might argue that this is right and proper the reality of funding processes is that 90% failures are common and at that level the funders are essentially making random decisions about what gets supported and what doesn't. Even if these various parts stand up to scrutiny the arbitrariness of the final selection process virtually guarantees it won't be funded in its entirety and so the entire grand design collapses. 'Creative Pull' projects can only stand a chance of success if they are judged together by referees from both sides working together and making recommendations to a single panel.

Other problems for 'creative pull' include the tendency for IST programmes to have shorter and shorter life cycles in which a creative project will inevitably time out. The reason for this we have discussed already, namely the planning horizons for companies, and the merits for those reasons have been questioned. There is another culture clash here, that between the essentially meritorious desire of funding bodies to ensure their money is properly accounted for and spent on what it was intended for, and that of an IT industry faced with a highly volatile market in which they have to respond in a time short with the approval of funding let alone that of spending it. This is a can of worms well outside CIRCUS's remit but it doesn't mean its outside everybody's remit. There is a great danger that, in ever increasing efforts to be seen to be spending research funds, regarded by many as a luxury of potential sinfulness, wisely, the outcome will be that the money is wasted when it needn't be. We would argue that what is really happening here is that the process itself has not been thought through properly and as a result, in attempting to achieve too many goals at once, manages to achieve none of them. Within the EU the individual prejudices of Governments, who don't understand this research stuff anyway [Patt99], are amplified by the decision-making process into programmes notable for the cynicism of the benefactors acquired through their observations of previous rounds of funding. This happens at a national level also, for the same reasons.

One could question even more widely and say why science and technology? The more obviously 'cultural' aspects of our society, as well-represented in CIRCUS, address economic needs just as technological ones do. One can argue that the great scientific boondoggles like CERN are ultimately of no greater economic relevance than theology, but in the past scientific research has given us atomic weapons and nuclear submarines and Governments will never forget that. No matter that an Old Master will cost more than the biggest super-computer at auction, there will be vastly more support for developing ever greater computing power than training artists who may produce the next great art movement. Old Masters are rarely lethal. For all of the Communists' many failings they at least realised the importance of culture in its classical sense (they wanted to control it and manipulate the population thereby) and a composer was regarded with perhaps greater reverence than an academician. (This may have been part of Russian culture long before the Communists.) There is

an old tradition in Russia of restraining artists. Perhaps for them an Old Master could have deadly implications, something which has been forgotten in less repressive Europe. The reason for such a contrast between dollars earned from science and dollars earned from selling paintings lies, we suppose, in the different models of economic exploitation. The economics of much creative work is driven by the mechanism of 'the best drives out the rest', which is the driving force behind the Hollywood Model [Mick&96]. There is really only room for the 'stars' to flourish, but that doesn't mean there isn't a need for mechanisms to find them out. Too often it is left to chance, but incumbents have a vested interest in discouraging challengers too. Science, at least, is a process in which individual motivations tend to cancel out, which is probably the origin of the economic attention paid to it.

What the EU might want to do about culture is another matter. There isn't a 'European' culture as such (unless you're an American whose ancestors escaped one form of long-gone oppression or another), and not doing anything about one's 'own' culture is an invitation for someone else's culture to come and take over, and there is an obvious candidate here¹⁸ (over a good few Dead Bodies, we expect). Culture isn't stuff which can really be thought about in economic terms and the consequences of a cultural take-over are pretty devastating from the few times it happened. The EU may well want to resist such a thing and there are no doubt quite a few nationalities who would go along with that, given most European nationalities have quite ancient cultures, many of which are in retreat before the invader. But how? What kind of programmes could encourage the expression of a culture? Clearly, from previous examples, funding and funding mechanisms are crucial even though their effects may be unpredictable. There is a strong case for 'Creative Pull' playing a key role here. It is a concept of huge power if applied seriously in the context of developing an indigenous culture. Is there a will to do it? If culture goes on the agenda with a comparable remit to, say, IST then there needs to be serious thought given to what one is hoping to achieve and how its all going to be managed. This is and always has been well outside CIRCUS's agenda, but again it has to be someone's.

From here on our recommendations tend to slide off into the nitty-gritty and away from the broad-brush stuff. One of CIRCUS's early considerations was over Vertical Markets when a concern from André-Marc Delocque Fourcaud (CNBDI) happened to coincide with the publication of a book [Wolf99] on how the Film Industry managed to take advantage of vertical marketing to offload the risk of film projects. The point was that strip cartoons in Japan, typically *Mangwa*, manage to generate vertical markets by leading on to films (e.g. *Akira*) and all the vertical marketing that follows from a film project. This is a phenomenon that we are now beginning to see in connection with computer games, and it is not surprising that Japanese games (*Super Mario Brothers*, *Mortal Kombat*, *Final Fantasy*) are leading the way here. André-Marc's argument was that if this could be done in Japan, why not in Europe where a similar strip cartoon culture exists? The answer to the specific question is almost

¹⁸ As Jay Leno said 'We're going to ru in *your* culture, just like we ruined our own''.

certainly a matter of culture¹⁹, but this did lead us into a consideration of vertical markets generally, how they were formed, what support mechanisms there were behind them, in short the sector advantage issues which lead them to form in some regions and not others [Pat01].

While it is fairly obvious that sector advantage has caused an over-concentration of support mechanisms for film industry vertical markets on the West Coast of the USA and their consequent failure to establish themselves anywhere else, it was also apparent that the whole idea of vertical markets in this sector had only grown up in recent years. Further, the advent of digital technology[Bro00] as a burgeoning viable alternative to the medium of plastic film²⁰ opens up the possibility of one of those seismic shifts in the industry which can be exploited by canny outsiders. With the shift could come a shift in the economics of the sector advantage available on the West Coast. Three mechanisms were advocated, extension of the cross-media ownership laws to prevent distributors monopolising exhibitors (cinema chains) as well, extension of the tax break regime allowable on film projects to related vertical market products, and the development of national film schools into research and training centres for all levels of the vertical market.

What was more interesting was the sort of entity which could be considered to be a vertical market element. Already known to be part of the vertical market were such things as documentaries 'The making of..', 'The story behind..', the film music, the book of the film, franchises, toys, games, Tee shirts, etc. In essence "The making of.." and the book of the film were themselves the basis of training materials which could be studied in film schools, art schools and media courses. Now programme commissioners are beginning to insist that new projects have some kind of Web presence, essentially advance publicity, and that they would have ownership of it as part of the rights package. However "The making of.." is essentially a taster for a film product which itself now needs to have a taster (on the web), but its web presence could be far more substantial and could become a training or reinforcement element in its own right, a superset of its broadcast form rather than a subset. In some cases the same is true of the film itself, if this contains topics of any academic merit (e.g. history, geography, biography). Where technology is involved "the making of.." could extend to the technological means used and their scientific and mathematical origins. The extent to which one could back-reference through knowledge and culture is significant even for the most unlikely film projects. A good example of this is the ever increasing number of *Star Trek* franchises, where not only are the most advanced technological means used to generate the imagery, but the bogus science could be analysed and its relationship to genuine scientific knowledge²¹ elabo-

rated[Krau98]. Film projects could make a powerful contribution to our knowledge base and teaching aids, but while many have speculated that the film majors could come to dominate academic teaching by such means there is virtually no evidence of any moves in that direction.

Another CIRCUS concern which unpacked from this strand was models of academic teaching. This has resulted in some interesting exchanges due to the very different pedagogical traditions of practice based disciplines (art and art schools), disciplines with a significant practical element to support understanding (music, and yes! - computer science) and those with a more purely theoretical element (e.g. mathematics, where students do exercises solely to determine whether they understand the theory). Even music and computer science with similar practice-based requirements have quite different pedagogies because of their different subcultures, although computer music interestingly short circuits the entire 'creative pull' argument by developing creative and technological concepts within the same discipline, something familiar to artists up to the point when their tools started to include computers. Computer Graphics, a subject which usually has its home in University Computer Science or Engineering departments makes a fairly sharp distinction between systems construction and image creation, again for reasons of how the culture developed (i.e. quite unlike computer music). Typically Computer Graphics has to struggle with other Computer Science sub-disciplines for curriculum time and for a long time has been regarded as a difficult dilettanté subject of little applicability, so marginalised. The practice of using computers to make artistic images is carried out in schools of art by people of an art and design background using software packages. It is here that 'creative pull' has to bridge the widest gap, and is most needed. It is also here that the different pedagogical traditions are furthest apart, so lessons from one side of the discipline for the other are hard to extract. If we are going to make progress here the most obvious way is to take a multidisciplinary approach and refine the lessons in the light of experience. For technologically-based reinforcement aids this could be an advantageous approach, saving development costs and resources. It could still fail if the pedagogical gap is too wide, but we won't find out until we try. On the other hand fishing around in other peoples' disciplines is an exciting experience for those positively motivated to do it. To the despair of generations of teachers students don't seem to have any enthusiasm for anything but grades, but maybe this approach will bring back the enthusiasm we all try to catch but so rarely find.

Another CIRCUS concern prompted by this is in the economics of technologically-based remedial aids. This is another example of "the best driving out the rest" economics[Pat99], with the promise of riches for the (few) academic superstars and the most unrewarding part of the academic experience for those obliged to follow in their wake (nearly everyone else). Such polarisation would also defeat the traditional position in scholarship which assumes individual prejudices cancel out if there are

¹⁹ although there is a European example in the form of Vadim's 1968 film *Barbarella* but here we expect that different contemporary cultural attitudes inhibited the formation of a vertical market around this particular film project. While true the Web says 'not in 2001'. Try

<http://www.multimania.com/angel/Barbarella/>

²⁰ Celluloid film has that unique and irreplaceable inflammatory quality so sought after for Molotov cocktails

²¹ Unfortunately people seem to prefer the bogus to reality. The *National Enquirer* in the USA is a best-selling newspaper famous for its promotion of bogus knowledge, while its counterpart, *The Skeptical Enquirer*, set up by genuine scientists anxious to expose the bogus in the *National Enquirer* for what it

is, struggles along at the price and subscription levels of a scientific journal. Far more people follow astrology than astronomy, and at least 10 times more people practising astrology than there are astronomers.

enough individuals contributing. The solution is seen to be in the equivalent of the 'Open Source' movement in software[Econ01], currently the subject of attack by its sworn enemy, Microsoft. We have been striving to see how the Open Source movement can offer financial incentives to its participants while encouraging wide participation thus defeating polarisation. If we can understand that model then it should be possible to transfer it straight across to telematics-based learning, although it is also argued that this is a medium we don't understand well enough to use as yet. This hasn't stopped plenty of people trying, with the outcome that there is now a consensus of opinion that our present understanding of what these models should look like don't work. Our view is that the absence of evidence is not evidence of absence and that maybe some rather more imaginative thinking, certainly plenty more R & D and demonstrators, are all required. Again culture seems to be the main inhibitor of thinking out of the box. After all we are trying to replace centuries of pedagogical experience with ignorance.

One important feature of Open Source is that it encourages de-facto standards and the IT industry is always keen on standards. They save money overall and encourage competition, also if its your standard you can become very rich and dictate how the market develops. CIRCUS has made contributions on the individual level to the MPEG 7 standards debate, seen to be critical to the creative industries. This experience, however demonstrates the lack of creative/cultural user representation within standards development bodies. One sector which has not been supported in any obvious way within programmes like IST is that of contributions to standards. The point here is the will to do it rather than the mechanics, although simply providing funds to support working on standards bodies would seem an obvious way to go. The kinds of contribution one has to make to standards bodies also depends on such things as the externalisation and structure of implicit knowledge which has to be elicited presumably through targeted projects intended as precursors to demonstrator programmes for standards bodies. There seems to be no provision for workplans derived from the agendas of standards bodies in this way. It's a black hole.

Finally, it is fair to say that the specific goals of CIRCUS in respect of content, medium and technology, and the ways in which these were refined in the original proposal have not been promoted in IST projects mainly because there seemed few, if any, work programmes in which they could flourish. More usually the topic had to be smuggled in by the back door into some project which seemed to address a quite different agenda. We would include in this the development of experimental interactive creative environments in their own right rather than for their social goals and something which has been the subject of considerable misunderstanding within CIRCUS (apparently because of a culture clash), namely the whole issue of styles as a means of understanding the strengths (manuals of good practice) and limitations (techniques for mitigating inherent constraints) of new media. One could argue[Yu98] that a well-known 'hard' technological problem of common interest, the automatic in-betweening of cartoon drawings for animation, can be solved by such means, and there may well be others. We are reminded of the story about Charles Babbage who, by all accounts was an irascible gent, and hated organ grinders (a common feature of the London streets of the early 1800s). He was wont to chase them down the street if they disturbed him thinking out his designs for new computation engines. One of his particular

problems was how to control the computation. If he had but thought that whoever had supplied the organ grinder with his instrument had solved an equivalent problem long previously (remember the analogy between music and computer programmes) then the history of computation might have been very different. All he needed to have done was to invite the fellow into his house and had a peek into the box to which the grinder's handle was attached. If he'd had the sense to do that he'd have also realised how to solve his problem²².

6. Who needs whom more? (conclusion)

It should be borne in mind that this is a somewhat one-sided view of CIRCUS so much of the cut-and-thrust of what we've discussed is under-represented. We believe, however, that we've captured the essence of what CIRCUS has been trying to do and much of where we think we are and can conclude from our work. Our real discovery was that the CIRCUS agenda was far larger than we imagined, so its full realisation could be fare for many children to come. If, indeed, we accept that we need to address cultural issues as eagerly as technological ones, and be able to improve our economy thereby, then the 'creative pull' model we have talked about so much could be the main engine by which such engagement could be made. Most particularly for 'creative pull' to work, it is essential that cultural artefacts be permitted to be at least the partial embodiment of the outcomes of projects which use it. Such a development would be by no means novel. The concept of the practice-led PhD[Pat&01] and the next round of the UK's Research Assessment Exercise (RAE) both allow for artefacts to be involved in the assessment process. Were the EU to adopt this²³ with 'Creative Pull' it would just be in line with other developments which have preceded it at national and international levels.

Of course the whole CIRCUS idea could be dropped from future EU agendas but if that's done, as we've shown here, the not only does that put legitimate lines of enquiry beyond reach but puts in jeopardy possible lines of defence against the sort of Cargo Cult culture waiting in the wings to exploit any weakening of the sense of identity that an independent culture engenders. Something like this seem to be happening in Japan, with its bizarre imitations of US icons which somehow completely manage to miss the point, or maybe it's the sameness on top of something completely different that is the point. Either way, it's a warning.

There is one final closing point, and its to do with the question of whether the culture wars of the 50s are relevant to-day, and also the question of (culturally) different models of discourse. In 1996 a Professor of Physics, Alan Sokal, published a now notorious spoof paper 'Transgressing the boundaries: Towards a transformative hermeneutics of quantum gravity' which was accepted in all seriousness in the refereed American cultural studies journal *Social Text*. It was not just any old edition of *Social Text* but a special edition devoted to rebutting the criticisms levelled against postmodernism by

²² A science fiction story written by William Gibson and Bruce Sterling 'The Difference Engine' starts with this premise.

²³ This may be changing even as you read this

several distinguished scientists. After publication Sokal immediately revealed the hoax and thereby precipitated a 'fire-storm of criticism'²⁴ in both the popular and academic press. Much has been made of the success of this hoax but Sokal himself [Sok&98] takes the view that his goals were quite modest in that he wanted to expose the abuses of scientific concepts by the same people who were attacking the whole scientific programme altogether, the so-called 'anti-science' movement. Essentially he was saying that this particular Imperium was underdressed.

Why are we highlighting this particular event (apart from our suspicions that the odd whiff of postmodernism has crossed the debating table from time to time)? Sokal [Sok&98] himself refers to 'the two cultures' in his analysis of what he thinks has gone wrong, namely the worsening of the tensions which have always existed between them which is progressively undermining the conditions for a fruitful dialogue between the humanities and social sciences on the one hand, and the natural sciences on the other. The particular point he makes concerns the different cultures underlying the conventions of inference in the different disciplines. Sokal points to the use of words. In science sometimes ordinary-seeming words are given precise definitions which capture the essence of the context in which they are used but do not necessarily capture all the cultural baggage heaped on their homonymics over centuries of more prosaic use. It seems that in philosophy the authority of the user of words is significant in the pattern of inference, and that scientific terms, which carry their own authority but only in context, can be plundered at will if the reputation of the user lets them get away with it. Sokal tells a story to illustrate the point:

We met in Paris a student who, after having brilliantly finished his undergraduate studies in physics, began reading philosophy and in particular Deluze. He was trying to tackle Difference and Repetition. Having read the mathematical excerpts examined here [Sok&98], he admitted he couldn't see what Deluze was driving at. Nevertheless, Deluze's reputation for profundity was so strong that he hesitated to draw the natural conclusion: that if someone like himself, who had studied calculus for several years, was unable to understand these texts, allegedly about calculus, it was probably because they didn't make much sense. It seemed to us that this example should have encouraged the student to analyse more critically the rest of Deluze's writings.

Anyone who still thinks that there isn't a problem between 'the two cultures' has definitely not been paying attention.

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²⁴ Our favourites are *Figaro*: "C'est la Guerre", and Magiori in *Libération* "Humourless scientific pedants who correct grammatical errors in love letters"