A brittle discipline: Interdisciplinarity and Music Technology

Carola Boehm

Manchester Metropolitan University, Department of Contemporary Arts

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1. Abstract

Five years ago I wrote an introductory article for a journal, in which I considered the state of music technology degrees in our universities in the UK. Having seen where higher education (HE) policy has taken us, and having had the fortunate opportunity to be heavily involved in shaping genuinely interdisciplinary provision that considers interdisciplinarity with all its warts[1] and perks[2], I thought it time to consider the implications of HE policy on interdisciplinary subject areas, to explore specifically the gaps that I identified five years ago and to consider how the current climate is affecting them. This article will cover the ever-widening disciplinary gaps that are appearing in HE and focuses specifically on those gaps that are substantially affecting various interdisciplinary areas of learning and research in HE. It uses music technology as an example case study. Even the process of placing of this article into an academic journal demonstrates the existing challenges; in its interdisciplinary nature its eligibility to feature in a subject-specific periodical might be questioned despite its high relevance for it.

The article also attempts to demonstrate models that support interdisciplinary teaching and research, which hopefully are able to mind and furthermore mend various existent gaps. With any luck it will disrupt some of our pre-postmodern concepts of what a university is, to be superseded by a more postmodern acceptance of society as constructivist learning communities, and universities as enablers of these communities. In this exploration, I follow a trajectory, from exploring to mending the gaps, and then finally to discussing in detail a specific methodology that represents one way forward out of the interdisciplinary quagmire.

2. Introduction

Like many other academics, who have experienced whiplash from the last few years of policy changes, I found myself pondering about the essence of universities, and how the government considers and perceives their value. Over last 20 years, universities have "been forged into a state 'system' largely paid for by the state and subject to extensive central control"(Graham 2002:21), suddenly to be thrown into a half-way house of free-market competitive forces whilst a large amount of central control through various policies still remains. Some of the long-standing core educational cultural prerogatives were perceived as being slowly unravelled. And this unravelling is not simply a

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[1] Examples: ambiguity of definitions, unprecise usages of term, misconception of coverage, etc.
[2] Examples: methodological richness, real-world relevance, disruptive to HE institutional constructs, etc.

process that happens only in HE, but also affects secondary education, with its own reforms over the same decades. Educational systems are challenged in specific ways, some of which are particular relevant to the area of music technology. These may be summarised as:

- The challenge of the economic imperative – make it (education) cheap(-er) / (more) sustainable / (more) flexible

- The challenge of integrating locally identifiable culture whilst maintaining global relevance (local identities vs. global economies)

- The challenge of supporting interdisciplinarity within disciplinary structures

- The challenge of 'minding the gap' between the arts and the sciences

- The challenge of the value divide between the 'academic' and the 'vocational'

3. Education Economics

Sir Ken Robinson, in his January keynote speech at the Royal Society for Arts (Robinson 2010), available in a lovely RSA Animate video, gives a short summary of the first two challenges:

> "Every country on the earth is at the moment reforming education. There are two reasons for this. The first of them is economic. They are trying to find out how do we educate children to take their place in the economies of the 21st century – how do we do that – given that we can't anticipate what the economy will look like at the end of next week – as the recent turmoil has demonstrated. How do we do that?"

> "The second is cultural: Every country on the earth is trying to figure out how we educate our children so they have a sense of cultural identity, how do we pass on the genes of our culture, while being part of globalization. How do we square that circle." (Robinson 2010, 4 February 2010)

For HE similar challenges apply, how can we make HE affordable in an economically challenged climate. As the 2010 spending review and the Browne report (2010) on HE have demonstrated, the British government seems to have found its own very special way of squaring the economic circle. It is something which probably not even Ken Robinson could have predicted at the time he gave this speech: that our public higher educational institutions would be privatised in all but name. As Stefan Collini at the time succinctly stated:

> "Essentially, Browne is contending that we should not longer think of higher education as the provision of a public good, articulated through educational judgment and largely financed by public funds (in recent years supplemented by a relatively small fee element). Instead, we should think of it as a lightly regulated market in which consumer demand, in the form of student choice, is sovereign in determining what is offered by service providers (i.e. universities)." (Collini 2010:23)

This "retreat of the state from financial responsibility" (2010:23) from its HE sector is of course was one way to meet the current economic challenges. But this ignores the "public interest in the provision of good quality education across the system, and the means for universities to make informed intellectual choices about the subjects they teach." (2010:25)

There are obvious dangers in moving to a society that regards universities as private institutions with economist calculations of value, calculations that negate its remit for learning as a public good and rather sees learning as a measurable assets for individuals to invest in. This ideological shift from learners to investors, from students to customers has large repercussions for the cultures surrounding learning communities, as well as the communities around them and society in general. For instance, there is a growing unrest in academia around the simplistic use of student satisfaction being used to measure and evidence teaching quality. The term 'student satisfaction' evokes a business-customer relationship and is actually derived this context. 'Customer satisfaction' originated out of a commercial context and stipulated that one should be able to measure satisfaction of services and products.

> "According to the students-as-customers approach, students and their educators are engaged in a value exchange relationship. Students exercise educational choices by selecting institutions and enrolling in classes that best meet their personal needs. Students also pay for their education, expect their schools to offer a certain level of instructional quality and view faculty members and staff as primary service providers." (Halbesleben, Becker, and Buckley in Serenko 2010:2)

Serenko continues to point out that the concepts surrounding this term, and the cultures from these sectors, will influence how our learning is facilitated in universities. But it is questionable what a 'customer-focused service' actually is within a learning environment, as the active engagement of the students is actually needed.

It is often stated in the current climate that universities need to change their business models and find new business oriented analogies. Suggested models are given, such as for instance subscription

business models that include the active input of the customer as well as access to services (gym membership schemes, 'you get out what you put in'). Such voices are suggesting that these new models pose solutions for making HE affordable and that the 'traditional business model of university' is not. Our current fee paying business model is one where the student pays with his/her future income. In the UK, the current fee-paying regime has already raised alarms with financial analysts, and future student debt is expected to overtake all other forms of debt in Europe, Australia and North America. (Leclercq 1967; Wilson 1998; Browne (Chairman) 2010).

An adoption of a different income model, for universities to do what they do, is of course is not only the consequence of lack of funding, but also a significant shift in the perception of what universities are for and whom they benefit.

The old concepts that higher learning exists for a public good is in the process of being replaced by one – as Bachan suggested earlier this year – derived from a (not quite so old) human capital theory (see Bachan 2013). Bachan quotes Gary Becker, who in 1993 laid out in a 392-page book how a student's investment into education can be analysed, considered and conceptualised like a business investment. Becker, a recipient of the 1992 Nobel Prize in Economic Science, considered the investment in education in relation to salary, and with his wider economic theories was considered a pioneer of applying economic analysis to human behaviour.

Becker's conceptualisation of learners reduces them, as some of his critics have observed, to economic entities. Universities are thereby forced to become part of an economically conceptualised model, one that is highly attractive to governments needing to cut the costs to HE when ' higher learning as a public good' is perceived to be simply unaffordable.

An increasing pressure currently is the uptake of Massive Open Online Courses (MOOCs), which in themselves raise the question of shifting traditional methods of learning in - and with it the traditional business models for - HE. According to a large US investment agency

> "The recent rush by leading universities in North America and Europe to create collaborative networks offering free online courses through Massive Open Online Courses (MOOCs) marks a pivotal development for *the higher education* sector. MOOCs signal a fundamental shift in strategy by the industry's leaders to use their powerful brand reputations to get ahead of rapid technological changes that could destabilize their residential business models over the long-run." (Kedem and Puchalla 2012)

In theory, elite universities, which have traditionally always had low and more costly staff-student ratios, would now be able to attract and take on exponentially more university students, thus

endangering the sustainability of everyone else. Who needs a face-to-face learning provision leading to a degree in mathematics from Manchester Metropolitan University if you can get one from Harvard University online, whilst staying at your parents' home? A new and cheaper way of providing learning is emerging, and there are plenty of governmental incentives for universities to consider these pressures by suggesting that they have to shift their business models. That Kedem has also some words of warning about its long term destabilization potential for their own traditional models, thus endangering the brand reputations which have made it attractive in the first place, is often overlooked by policy developers.

But I do find myself wondering why university managers, as well as politicians, so desperately want to find a model that sits outside the world of learning, rather than considering institutions involved in the learning economy a category of its own, with drives, motivations and social forces at work in which a comparison with a commercial sector is simply unhelpful. Why should universities be likened to anything other than simply universities, especially considering that they and their models have been around for a substantial amount of time, certainly longer than any gyms, IT businesses or virtual environments have? The model of universities as a learning community which uses aspects of autonomy and mastery to incentivise innovation and research development, has in fact been adopted in the biggest modern enterprises of this age, such as for instance Google (see Pink 2011:96).

The diverse landscape of Higher Education, and the diversity of cultures and practices within institutions, have really more to do with community dynamics rather than specific business models towards value or income accumulation. If one really needs a metaphor, a new model for how universities can do what they do best, then how about the one in Watson's wonderful book about happiness in HE, where he – quoting Aitken – compares universities to "turbulent Italian Renaissance Towns"? (Aitken in Watson 2009:85)

It does seem to me that the models, or the metaphors, for what universities are, and how they encourage and manifest learning, have much more to do with social behaviours than with simplistic models based on business and economics. The motivation for learning, and for remaining a part of – and being happy within – a learning community, is – according to Pink - driven by three factors related to motivation: "Autonomy-Mastery-Purpose" (Pink 2011). Mapped onto the HE sector as a whole it can be conceptualised into

a) independent learning on all levels, from skills and knowledge to new insights in a research context;

b) the existence of a learning community supporting mastery; and

c) a community which continues to purposefully contribute to learners' own academic development.

That the above factors are effective for motivating a workforce might be evidenced by the phenomena of academic disconnects; sector morale is low but passion for the subject areas high.

> "Go around your university or college and ask the first 10 people who
> you meet how their morale is. The response will always be 'rock-bottom'.
> Then ask them what they are working on. The responses will be full of life,
> of optimism and of enthusiasm for the task in hand." (Watson 2009:1)

Mastering creative processes is a crucial activity for the diverse subject of music and music technology, and undoubtedly fitting into Pink's motivational factors. Even the government considered it important and revisiting the reports from the Department for Culture, Media and Sports (DCMS) that sparked a new trust in our creative capability, in 2009 I wrote that the

> "Government has (finally) caught on to the fact that money is to be made by being creative,
> and is providing funding for making "Britain the leader in the new creative economy."
> (Boehm 2009a)

The government's vision in 2001 was of "a Britain in ten years' time, where the local economies in our biggest cities are driven by creativity" (Department for Culture 2008), and this was a major shift in governmental policy, a shift that I at the time welcomed, calling it the "beginning of an exciting brave creative new world" (2009). At that time I did not know that it would end so soon. But in the 2000s, creativity – and with it the creative sector – was seen to be important. The government's *Creative Industries Mapping Document* (Department for Culture 2001) mapped all industries that can be associated with the 'creative professional' and made it clear that the vision is one where our industrialised economies of the future will succeed only if we manage to bring in processes that support creativity and the creative professional. And as a result "the creative industries have moved from the fringes to the mainstream" (Department for Culture 2001).

This influenced various educational provisions. The government announced in 2001 initatives to "see us putting creativity at the heart of education" (Smith 2001), supported by a substantial financial incentive of £40 million. Creative workshops abounded, and new research centres and educational conferences started to be tagged with the word 'creative': a new terminology was emerging, from

'serious gaming' to 'serious creativity', as for example at Manchester Metropolitan University, where – between the years 2008 and 2012 – we had an 'Institute for Serious Creativity'.[3]

Statistics emerged that supported the view that this strategy was working out, and in 2007 the DCMS published figures that indicated that the creative industries were comparable in size with the financial sector, accounting for about 7.3% of the economy and employing 1 million people. "The livelihood of a growing proportion of British citizens will depend upon the sector maintaining its trajectory of growth" (The Work Foundation 2007).[4]

With the challenges that the financial sector has faced in the last few years, it is not surprising that the creative sector has started to play an increasingly important role.

Even the biggest businesses have subscribed to making their leaders more creatively aware, as a major 2010 IBM survey of more than 1,500 chief executive officers from 60 countries and 33 industries worldwide demonstrated. The study demonstrated that "chief executives believe that – more than rigor, management discipline, integrity or even vision – successfully navigating an increasing complex world will require creativity". (IBM 2010)

 The study initially analysed perceptions around handling complexity, recognising that globalisation has provided additional challenges that businesses have had to meet. The perceived solution was almost unanimously considered to be found in 'creative leadership', and the model from the survey demonstrates that this term was not only giving lip service to creativity, but that really meant it (see Figure 1).

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[3] Centre for Serious Creativity & Constructive Thinking (2009), Manchester Metropolitan University, DeBono Foundation, http://www.debonofoundation.co.uk/index.php Last accessed: 2 February 2009.

[4] "The work foundation 'staying ahead: the economic performance of the UK's creative industries', Work Foundation / DCMS, June 2007.

Figure 1. 2010 global CEO study

Despite all this support for creativity, and even with the recent successes in the creative economy, it is questionable whether a sector as fragmented as the creative one is able to provide enough pressure and campaigning momentum to ensure that this support for the learning provisions in HE for the creative sector is kept up. When Lambert gave a speech in 2010 in response to the Browne report, he suggested that the fundamental changes ongoing in HE represent a shift from "a supply side model in which university teaching is largely financed by public funds to a demand side approach, in which private funding plays a much bigger part" (Lambert 2010).

So even with students continuing to choose the more creative and 'softer' subjects, it is questionable whether individuals and families faced with a debt of more than £27,000 will still choose subjects, such as the arts as they would be considered as less value for money when comparing the graduate salaries of more lucrative professions.

Not only does this intervention distort the stable basis of student choice that has existed for at least 20 years, but also the additional incentives for universities to focus more on the sciences through the relevant funding schemes make it difficult for creative subjects to be supported sufficiently for the economy to continue its own 'creative pull'.

4. Disciplinary divides and third culture thinking

The current situation obviously represents a force that again widens the disciplinary gaps. Already there are some indications that HE institutions are drifting more into the sciences, where more third-

stream income can be expected (examples could be seen in the closures of the music department at UEA in November 2011, and of those at Exeter in 2006, Reading in 2004 and Lancaster in 2012). Those universities which proportionally rely on more student income (e.g. more often the post-1992 universities) have at least some incentive in the form of student income from the continued popularity of arts and humanities subjects. Detrimental to this movement is, however, the proportional decrease of financial support available for arts and humanities, in contrast to the blatant prioritisation of STEM subjects (science, technology, engineering, and mathematics) .

STEM support is obviously a good thing, but the lack of vision that is demonstrated by not considering how we support the creative industries through arts and humanities education is simply breathtaking. The announcement in 2010 (Attwood 2010) of the end of virtually all state funding for arts and humanities initiated a substantial squeeze for universities, but also re-invigorated a very old gap between the sciences and the arts, which we – who proudly called ourselves, after Brockman (1995), 'The Third Culture' – thought we had finally overcome.

So it is a worry that our current young people at school and university, embarking on their journey into or alongside the creative industries, thus – as the government stated in 2001 – attempting to continue the trajectory towards our biggest cities being driven by creativity, will have a hard time in a world in which the government considers only the sciences to be worthy of state subsidy at university level.

It is a very old-fashioned view of the world indeed, and it throws the creative industries back into the early 1990s. On the one hand this is due to the basic misperception of which area of knowledge – and with it which learning – is valuable and which is not. On the other hand it is also due to the misconception that we have a greater need of competence and skill than of creativity and critical thinking.

The term 'core competencies', which was introduced back in the 1990s by Hamel and Pralahad, took hold extensively in industry as well as in HE (Prahalad and Hamel 1990). Even then this could have been seen, as Kupferberg argued (2003), as an outdated concept, one still revealing a traditional industrial mindset that "that builds on Adam Smith's idea of increasing specialisation as the key to the wealth of nations". Kupferberg goes on to question, "Do we imagine that education automatically becomes better if it builds on the highest possible degree of specialisation?" (Kupferberg 2003).

So not only is the disciplinary divide between the arts and the sciences back, but an outdated model of specialisation stemming from the industrial age is still appearing as a barrier to achieving solutions to problems of the real world, problems that need genuinely interdisciplinary approaches.

This struggle is fought on the plateaus of educational funding, whether secondary, further or higher. Governmental directives influence how educational systems are financially supported, and thus inherently display a certain worldview, one which some suggest is not always conducive to taking society forward into the next century.

Until now, universities have always created their internal economies; some universities have been known to subsidise physics provision with student income from the humanities when it was needed. Cross-subsidisation is a necessary tool for keeping essential, important, socially relevant, strategic, potentially research impact-rich degrees sustainable. These decisions have always – until 2010 when state funding for arts and humanities ceased to exist – been in the hands of those individuals who could be considered the keepers of knowledge. However, when Browne attacked this principle and skewed the old-established balancing act of cross-subsidisation by proposing to not fund any arts, humanities or social science degrees, he gave an open invitation for the old monster of the cultural divide between the arts and science to re-emerge.

As a society, it seems, we still have not learned much: the classical divide between the arts and the sciences is still there. Not so long ago we celebrated the 50th anniversary of C. P. Snow's classic paper on the cultural divide of the arts and sciences, *The Two Cultures* (Snow 1959), and yet the gap is still there. And judging from how the politicians and policy-makers talk about the value of arts and humanities, these different cultures are certainly not understanding each other.

In universities up and down the country, academics have managed to increase interdisciplinary activities, albeit more in research and less in our undergraduate curricula (and almost scarcely at all in secondary education, bar the individual 'project weeks'). This obviously affects music technology specifically, since it is a discipline genuinely situated between subject areas, and I refer to previous papers that describe these challenges in all their details for the subject as a whole, and perceptions of the field specifically (Boehm 2002; Boehm 2006; Boehm 2007; Boehm 2009). In the first decade of the new millennium, we may have thought the disciplinary divide had been breached, but even in research this divide was still evident.

In 2009 Johann Bollen published a 'Map of Science', which was based on data from tracking article citations across scholarly journals (Bollen, Van de Sompel et al. 2009). The result was striking (see Figure 2), especially if coloured by discipline to emphasise the sciences and the arts. With arts and humanities in yellow, sciences in
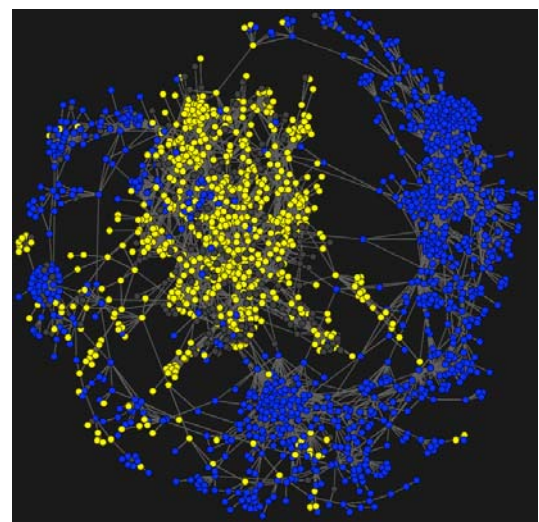

Figure 2.– Bollen's Map of Science

blue, the gaps are clearly evident. And what we are missing out on, by continuing to work in mono-disciplinary fields, is the potential to gain knowledge into those areas of our reality and society that can simply not be understood when considering them from a mono-disciplinary angle.

We live in interdisciplinary times, have an interdisciplinary society, the biggest challenges of our contemporary world tend to be interdisciplinary in nature, and as Ellis in his book on interdisciplinary learning and teaching mentions, "problems may cut right across borders" (2009:4).

Our reality is complex, and the need to solve complex societal problems and the power of new technologies is a powerful driver for raising interest in interdisciplinary enquiries. However, it seems that in more structured learning environments, as represented in higher-education undergraduate provision and secondary education (apart from primary education and postgraduate degrees), there is still

> "substantial complexity involved in providing a supporting and educationally valuable environment for students and staff in an area which reaches not only over different scientific domains, but also over different working and investigatory methodologies, different approaches for presentation and practice, different underlying – but implicit – justificational hypotheses, different vocabularies and terminologies as well as different conceptual frameworks – not even to mention often different budgets and administrative units." (Boehm 2007)

But this divide, specifically the one that the new HE funding regime seems so readily to support, stems from a university designed for a different age. It is based on the 'modern university' in the 'intellectual culture of enlightenment' which can still make it hard for interdisciplinary education to happen, specifically in undergraduate courses. This is not so true for primary education and not the case for research, where the freedom from constant governmental schemes in relation to quality assurance and monitoring practices have made sure that interdisciplinarity remains like flowering weeds in the cracks of a mono-disciplinary concreted consciousness.

This "project of modernity", as Habermas called it, "stems from the 18th century (age of enlightenment), aiming at developing objective science, universal morality and law, and autonomous art according to their inner logic" (1983). It is based on the belief that there are knowledge domains that are finite and defined, that there are distinct academic and educational communities that are identifiable by their own methodologies, terminologies and belief systems. It still keeps hold of the notion of deep specialisms, but this concept is also one that stems from an outdated, modernistic

view of the world, and we should ask ourselves whether we really need deep specialisms without broad interdisciplinarism.

> "Early modern natural philosophers were more often than not dilettantes in their experiments and humanists by education. It is unlikely that a new Leibniz should emerge today. But it is possible that, if he were alive now, he would still try to open gates." (Arikha 2005)

The world is not disciplinary, and there is a danger that we will omit a large part of our continuous search for knowledge if we don't deal with the gaps in between. But with Browne's blueprint for this current model for funding universities (not even considering the questionable sustainability of this model), any interdisciplinary mingling might all end before it really can take off.

A stab at imagining the likely impact for the future for those who believe in the value of the liberal arts and interdisciplinary subjects looks grim. Conservatories might be asked to consider mergers, and the humanities and arts will survive if only subsidised by the sciences. The old monster within our midst will return with a vengeance; the old divide between the arts and the sciences has re-emerged.

It may be that the government believes in following some of Edward Wilson's claims from his controversial *Consilience (1998)*, in which he maintains that science will in time subsume all the humanities. 'Empricism will rule, should rule', he implies, but this reductionistic process is – as one reviewer maintained – simply delusional (Thielke 2004:459), and is yet another example of the conscious lack of acceptance of the validity of different methodologies for knowledge acquisition in the various disciplines. It constitutes evidence that there is still a perceived dichotomy in what research is and how knowledge should be acquired (compare to Fig.3). And of course it is part of the long-standing disagreement

The perceived Dichotomy of research methodologies

Quantitative	Qualitative
Empirical	Constructivistic
Positivism	Phenomenalism
A posteriori	A priori
Analytic	Synthetic
	Rationalism
Modernism	Post-Modernism
Linear	Non-linear

Figure 3. Arts/science divides (Boehm 2007)

that can be traced to the "contrasting assumptions about how knowledge should actually be accumulated" (Moran 2010:150).

But the gaps are not only disciplinary. The above-mentioned modernistic model of prioritising highly specialised knowledge causes also problems for the divide between the practice-based (or vocational, but the different terms have different connotations) and the academic. This is evident in

secondary education, and the presence of the divide continues right into tertiary education. As Robinson suggests, the concept of dividing the vocational from the academic is based on a series of assumptions about social structure and capacity and a very specific intellectual model of the mind. This

"… was essentially the enlightenment view of intelligence. That real intelligence consists of this capacity of a certain type of deductive reasoning and a knowledge of the classics, originally. What we came to think of as academic ability. And this is deep in the gene pool of public education, that there are two type of people, academic and non-academic. Smart people and non smart people. And the consequence of that is that many brilliant people think they are not, because they are being judged against this particular view of the mind." (Robinson 2010)

Robinson goes on to suggest that this has caused some of the perceived misery in our current school education systems:

"The problem is that they're trying to meet the future by doing what they did in the past. And on the way they are alienating millions of kids, who don't see any purpose of going to school. When we went to school, we were kept there with a story, which if you worked hard and did well, and got a college degree you would have a job. Our kids don't believe that. And they are right not to – by the way. You better having a degree than not, but it is not a guarantee anymore. And particularly not if the route to it marginalizes everything you think is important about yourself." (Robinson 2010)

Robinson and his followers suggest that we need to get over this concept of a divide between the 'academic' and the 'non-academic', the 'theoretical' and the 'practical', and accept that this is a myth. And there have been sufficient changes in HE curricula to suggest that we have been making progress since 1992: conservatories were given university status; practice-as-research (PaR) has been

Figure 4. Designed by French art-scientist Nelly Ben Hayoun, the installation takes visitors on a subatomic adventure, in the capable hands of leading particle physicists. (MMU in the News 2010)

accepted in academia as a valid research methodology; and the interest in artistic representations of science topics has been given the new social role of bringing science closer to the public, be it learning mathematics through music, sport science through dance, or astronomy through installation art (see Fig. 4 for example).

5. Academic, vocational and practice-based

The tensions between the perceived academic, and the perceived vocational has been haunting the sector since the Further and Higher Education Act of 1992. The tensions around the concepts of vocational vs. academic and practice-based vs. intellectual are still ongoing. That these two concepts seem separate from each other is another expression of the false dichotomy that still stems from an enlightenment view of intelligence.

As mentioned above, the concept of this division of the 'vocational' from the 'academic' is based on a very specific intellectual model of the mind: that our perception of what academic study is was formed at a time where the concept of intelligence was limited to the ability to reason deductively. (see Robinson 2010)

In the approximately 40 structured interviews I carried out as part of a Palatine-funded study into interdisciplinarity in HE, an interesting insight into these tensions emerged from questions about perceptions of degrees as being mainly *practice-based* or *vocational*. The choice of one or the other was mostly decided quickly and with confidence – the associations and connotations of these terms being perceived as clear – whereas the request to define the difference of these terms resulted often in interviewees expressing difficulty in differentiating these two terms (Boehm 2006).

The current perception of the sector is that the new universities, especially when they were still polytechnics, were predominantly vocational, teaching and 'professionally' oriented, whereas the older universities were more research and academically oriented, the term having more connotative credence than explicitly useful meaning.

But when considering the history of universities, and the fact that the British university system has always exposed with its terminologies and cultural expressions[5] more reference to its medieval predecessors than to any Humboldtian ancestry (like most German and US universities)(see Rudy

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[5] University gowns, the terms 'faculty', the governance, architecture, etc. Certainly, unlike the American system, the British university system had less Humboldian ideology embedded in its educational provision.

1984; Rüegg and Ridder-Symoens 1992)[6], it becomes clear where this confusion between vocational and academic is rooted. The medieval university was mainly organised around the seven liberal arts, including astronomy and music theory, grammar, logic and rhetoric. As well as studying for the Master of the Arts, one could engage in further study in law, medicine, and divinity. Therefore the most ancient universities in England, Scotland and Ireland have had a long tradition of provision in what we would call today the 'vocational', with its music scholars and law and medical professions. This perception of the vocational and/or practice-based was perceived to be disrupted when polytechnics joined the same sector in 1992. The binary divide had more to do with class perceptions and the enlightenment view of the mind than with content or subject matter. This binary divide has become even more blurred with the introduction of fees, when, unexpected by the government which introduced tuition fees, a former polytechnic, Liverpool John Moores, was one of the first universities to announce its fees at maximum level of £9,000. This may not have come as a welcome consequence of Browne's HE reform, but is certainly an indication of at least one strong movement to see the practice-based, the vocational, the academic as very similar indeed to each other.

Robinson obviously sees this divide as being detrimentally influential in the secondary educational sector, but also suggests we need to scrap the perceived dichotomy between the 'academic' and the 'non-academic', the 'theoretical' and the 'practical'. "We should see it as what it is: a Myth" (Robinson 2010).

And one could suggest that the 1992 Act was an attempt to do just that, just as was the introduction of the performing arts, including dance, drama and theatre, into HE study. As will be explored below, a new model for these enquiries was needed, a new methodology, that put the practitioner in the centre and encouraged enquiries unbound by disciplinary thoughts. A new methodology emerged that mended the gap between the vocational and the academic, or in its own terminology, provided a continuing dialogical relationship between the practice and its critical discourse. By allowing the practitioner to be a central focus, it freed itself from disciplinary divides and developed a new culture in our HE sector. But before turning to practice as research, or PaR, another challenge needs to be explored in relation to the brittle nature of knowledge domains.

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[6] University models after Wilhelm von Humboldt were first established in Germany and France in the 19th century, and were based on liberal ideas about the importance of freedom, seminars and laboratories, focussing both on research and learning. By the early 20th century, this model has become the world standard. (See Rudy and Ruegg)

6. The breadth, depth and brittleness of disciplines

Universities are about acquiring and disseminating knowledge. And in the process of accumulating knowledge and considering the ever-expanding domain, gaps will appear. This may be a natural development. Sperber pointed out in 2005 that the "current disciplinary system may be becoming brittle" (2005), and that we are in need of a new postmodern acceptance of fragmented but self-organising areas of knowledge, in which, as Mourad suggests, "particular foundations would emerge in the course of the inquiry rather than be predetermined in the form of discipline-bound theories, methods, and schools of thought" (1997).

It seems that for the future, the classic model of the university with its departments, which tend to be largely homogenous in their disciplinary approaches, might need to be accepted as only one of many ways to support the facilitation of learning and knowledge for our contemporary society. Until recently, the *belonging* of disciplines to structures (departments, schools, institutes) often had to do with *how* we do something than rather *with what* we do, or, in other words, more to do with which methodologies are more similar, and which ones are not.

Music technology is a classic example of that. The part of music technology represented by sound recording, music production and Tonmeister, for example, is more and more predominantly taught by colleges and conservatories. It is perceived as vocational as it is more industry-related, and thus fits in with the more working practices within conservatories and music colleges. The part of music technology represented by computational musicology, music engineering, electronics and music, and audio engineering is predominantly taught in computing science and electrical engineering departments. Their practices often include collaborative work, such as software engineering and working in teams. Their research and enterprise as well as their professional practice are predominantly collaborative, with multiple-authored papers and teams of implementers. It often does not fit in traditional music departments, where the norm is the single author, the single manuscript, the single authored composition as output for a research. So it seems obvious that this aspect of music technology represented by electro-acoustic composition, sonic arts and electronic music is predominantly taught in music departments. (See Boehm 2007)

But this tenacious perception that departments could cover the whole area of a subject domain stems from the 19th century. As Habermas suggested,

> '"The project of modernity" stems from the 18th century (age of enlightenment), aiming at developing objective science, universal morality and law, and autonomous art according to their inner logic." (Habermas 1983)

With this came the notion that we could study a subject in all its forms, that its boundaries can be clear and defined, that there are, in fact, distinct academic/educational communities that are defined by methodologies, terminologies and belief systems. The consequences can be found in plenty of examples of music departments with faculties covering Medieval and Renaissance, Baroque, Classical, Romantic and the rest of the 20th century. This linear view of history allowed coverage. As a side-effect it elevated historic musicology, and tended to push other areas of music studies, such as systematic musicology, ethnomusicology, acoustics, music psychology, and to some extent also music theory and analysis, into the background. In this model of knowledge, everything could be subsumed in historic periods, including composition. Composition, of course, as we will see later, has had a very specific historic heritage, and a privileged position in the arts within HE. The culture of learning to compose via pastiche allowed it to be seamlessly integrated into linear historical conceptualisations of the discipline. The endpoint of this historical line is contemporary music as a discipline, this being understood to predominantly meaning composition.

For the last 20 years this linear historic model has continually been discussed as being problematic. Our knowledge has grown beyond the ability of university departments to provide educators in all its related fields. The knowledge has become expanded, so that deep knowledge domains increasingly appear as unconnected fragments within larger subject areas. This fragmentation is what Sperber re-conceptualised as 'brittleness'.

Increasingly other models are being tested, be it through more interdisciplinary schools or research institutes. For areas of learning and research which reach "not only over different scientific domains, but also over different working and investigatory methodologies, different approaches for presentation and practice, different underlying – but implicit – justificational hypotheses, different vocabularies and terminologies, as well as different conceptual frameworks" (Boehm, 2006) there will have to be new models which can take Sperber's brittleness, or its knowledge fragmentation, into account.

In terms of research methodology, it also calls out for innovation, and this is where it is of high value to consider the movement towards practice-as-research as an educational-cultural approach to allow particular foundations to "emerge in the course of the inquiry rather than be predetermined in the form of discipline-bound theories, methods, and schools of thought" (Mourad 1997).

In practice, evidence for the increasing acceptance of this concept of fragmentation, and with it less connected but deeper specialised degrees, could already be seen in the increasing numbers of degree pathways, their names pointing towards very specific nuanced provision. In 2006, there were

62 different degree names in use in HE, with 351 occurrences in the subject area of music technology, and these within in 62 institutions (Boehm 2006). And although the term 'music technology' was the most popular degree name (at 41.9%), the existence of 'music production', 'sonic arts', 'electronic music', 'recording' and 'sound engineering' already provide an example of the nuances of different sectors, contexts and communities, whereas the basic underlying skills and knowledge might be fairly similar. Everyone studies a bit of acoustics, everybody studies 20th century music, and everybody studies how to handle and manipulate digital audio.

It could be seen, I suggested in 2007, that within the field of music technology the various fields were moving apart in the process of becoming fragmented. Rather than seeing this as a positive process towards the 'natural' movement towards postmodern fragmentation, I – being located between the three knowledge domains of music, computer science and electrical engineering – saw this at the time as a destructive tearing apart of what I perceived to be one knowledge domain (see Figure 5).:
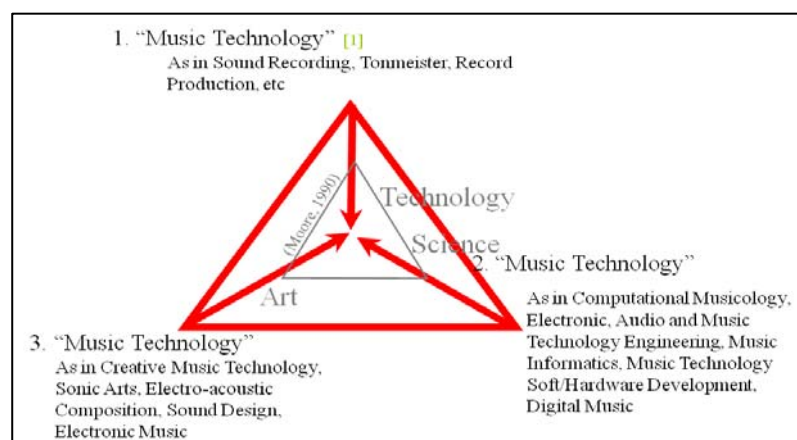
Figure 5. Expansion into different sectors (Boehm, 2007)

"Rather than seeing an emergence of a new discipline, such as the history of computer science has produced, we can see a movement that is tearing the content of this interdisciplinary field into three more and more distinct disciplines with their own methodologies and terminologies. Because what else is a discipline than a social construction and, according to Fish (1994:74) 'a grab-bag of disparate elements held together by the conceptual equivalent of chicken-wire'?

That part of music technology represented by sound recording, music production, Tonmeister, for example, is more and more predominantly taught by colleges and conservatoriums. That part of music technology represented by computational musicology, music engineering, electronics and music, and audio engineering is predominantly taught in computing science and electrical engineering departments. That part of music technology

represented by electro-acoustic composition, sonic arts and electronic music is predominantly taught in music departments." (Boehm 2007)

Especially in England, where most BA and BSc degree courses are only three years long, in contrast to Scotland's four year degree courses, the specialisation was a necessity in order to provide sufficient depth of skills and knowledge. It might be worthwhile noting that three-year courses make it difficult for interdisciplinary and multi-disciplinary degrees to be accredited by professional bodies, and it is no surprise that most accredited interdisciplinary degrees in this area are located in Scottish universities.

This relative short period of study for BAs and MAs in England has also proven to be difficult when it has been considered in relation to the Bologna process. UK MA degrees are not accepted by other countries, which normally have the equivalent of two-year MA degree before being able to progress to PhD study. Furthermore, it is often the case that a graduate of one subject is able to take an MA in another subject, something that would be impossible in many other countries outside the UK. In Germany, for example, until quite recently a full degree was a MA degree, which lasted about five years. The depth of study was created through length.

Thus the arguments of depth and breadth feed into this. And considering the concept of existing fragmented areas of knowledge, it might be worthwhile to explicitly state the possibility that we do need both. In order to tackle the biggest challenges that we face (energy, food safety, security, health, well being) or simply understanding the most essential aspects of human existence (creativity, happiness, knowledge, intelligence) we do need interdisciplinary approaches, and this consequentially means that we have to stop prioritising depth over breadth. The world is not disciplinary, and we will omit a large part of our continuous search for knowledge if we don't deal with the gaps in between.

It comes back to the concept of nurturing a third culture, one that is not bound to the disciplinary cultures inherent in the binary divide of arts and science. And for that we do need some new methodologies. Practice as research is one of them.

7. Interdisciplinarity as a discipline and third culture thinking

The culture around practice as research (PaR), including its own terminologies, ideologies and methodologies, would go beyond the two cultures proposed by C. P. Snow (1959), and deal with a third one, as predicted by Brockman (1995). Both Brockman and Snow used the term "third culture

thinking", and the new PaR methodology can be seen to have emerged from this background of encountering a boundary divide and attempting to devise bridges to gap it.

However, when Brockman uses the term 'third culture', in response to Snow, he implies that the scientific method, e.g. empiricism, should be considered much more widely (Brockman 1995) and that the criteria for membership of the real third culture include the acceptance of empiricism as a way of perceiving, finding knowledge, truth and reality. "The third culture consists of those scientists and other thinkers in the empirical world", he says and almost implies that the usual role of 'literary intellectuals' is one of middlemen between science and the public.

The purpose of this real third culture is thus reduced to a new generation (of scientists) who can make themselves understood, can talk to a public directly, can give evidence of their impact into society. Brockman gleefully suggested that now

> "…literary intellectuals are not communicating with scientists. Scientists are communicating directly with the general public (…) Third culture thinkers tend to avoid the middleman and endeavor to express their deepest thoughts in a manner accessible to the intelligent reading public" (1995)

Leaving out for a minute the fact that the culture of popular science literature is known to be a predominantly Anglo-American phenomenon, be it driven by the market or the level of education of a reading public, Brockman saw this third culture as a means of minding the gaps between the public and the sciences.

Brockman 'did not get it': he really was not able, or had no drive to make explicit what a third culture beyond the art/science divide could really be. And how could he, as his concept was leaning heavily on an outdated Hegelian concept itself, that of *Realphilosophie*. Translated literally as 'Real Philosophy' or 'Reality Philosophy', this denotes thinking about all phenomena within an empiricist methodology (Hegel and Hoffmeister 1967). But the concept denoted something rather more similar to our modern concept of 'applied science', or even 'applied empiricism'. Empiricism is here, however, seen to be the solution to all knowledge acquisition. The term clearly still has credence, even in the field of music. where the recent publications of books (e.g. *Empirical Musicology*) or journals (e.g. of (*Empirical Musicological Review*) demonstrate that there are many musicologists who themselves subscribe (only) to the empirical rule.

Brockman himself implies that Snow (1964) meant his kind of third culture:

> "In a second edition of The Two Cultures, published in 1963, Snow added a new essay, in which he optimistically suggested that a new culture, a 'third culture', would emerge and

close the communications gap between the literary intellectuals and the scientists" (Brockman 1995)

But joining Snow, albeit half a century later, Gold suggested another kind of 3rd culture and in 'The Hedgehog, the Fox, and the Magister's Pox' he argues that "the sciences and the humanities should foster mutual regard and respect instead of wrangling about supremacy" (Gould 2003) and arguing against the universal usefulness of reductionist approaches

What come to mind are the increasing number of projects in the area of performance research. Many fail at the methodological stage, where collaborating psychologists feel clearly uncomfortable not to have a controlled environments integrated in their research frameworks, whereas their suggested controlled environments using reductivist approaches are perceived as lacking relevance and make it impossible for meaningful insights to be developed into the complex scenarios that music performance in a real world require. In its complexity, it needs as much a reflective, qualitative, constructivistic and non-linear approach as it may need a reductivistic one.

Thielke, reviewing Gould, concludes that "that we must remember our historic humanitarian and scientific roots and that the guardians of intellectual culture have a responsibility to pursue truth unfettered by bias" of the two cultures (Thielke 2004). Snow's third culture has yet to still be found, and although we have have made progress on narrowing the gap, there is a big threat that within this political climate – in which state funding for arts and humanities provision in universities has all but stopped – it will come back.

I would argue to prevent it from coming back and to continue to work on narrowing the disciplinary divide between the arts and the sciences. For that, we need to really understand this divide, to understand what we mean by the term 'interdisciplinarity' and how we can genuinely support it in our HE systems.

Interdisciplinarity has various dimensions, from academic pedagogy, through the organisational and the political, to the social.

   i) The academic dimension includes questions about how we facilitate interdisciplinary learning, how we support interdisciplinary enquiries, which methodologies we can justify as be valid for these enquiries and how we structure our own curricula and degrees to allow interdisciplinary subject areas to exist.

   ii) The organisational and political dimensions include matters such as the design of university structures, policies and student income distribution models.

iii) The social dimension, at its heart, simply maintains that disciplines are most of all social constructs, and that without understanding this basic concept, the evolution and development of disciplines are not able to be understood.

Apart from these dimensions, it also helps to see disciplinarity as an umbrella concept with individual terms referring to various nuances. According to Stember and Seipel (see Seipel 2005) we can differentiate between

i.   *Intradisciplinary enquiries*, which involve mainly one single discipline, such as a musicologist analysing the harmonic structure of a symphony.

ii.   *Cross-disciplinary enquiries* tend to view one discipline from the perspective of another, such as a physics laboratory approach to understanding the acoustics of a musical instrument.

iii. *Multidisciplinary enquiries* draw on the knowledge domains of several disciplines, providing different perspectives on one enquiry. "In multidisciplinary analysis, each discipline makes a contribution to the overall understanding of the issue, but in a primarily additive fashion." In this, a study of music performance can include insights derived from psychology as well as historical performance practice.

iv.   *Transdisciplinary enquiries*, in Stember's words, are "concerned with the unity of intellectual frameworks beyond the disciplinary perspectives". Seipel goes on to suggest that they may deal with philosophical questions about the nature of reality or the nature of knowledge systems that transcend disciplines.

v.   *Interdisciplinary enquiries* require "integration of knowledge from the disciplines being brought to bear on an issue. Disciplinary knowledge, concepts, tools, and rules of investigation are considered, contrasted, and combined in such a way that the resulting understanding is greater than simply the sum of its disciplinary parts. However, the focus on integration should not imply that the outcome of interdisciplinary analysis will always be a neat, tidy solution in which all contradictions between the alternative disciplines are resolved. Interdisciplinary study may indeed be 'messy'. However, contradictory conclusions and accompanying tensions between disciplines may not only provide a fuller understanding, but could be seen as a healthy symptom of interdisciplinarity. Analysis which works through these tensions and contradictions between disciplinary

systems of knowledge with the goal of synthesis—the creation of new knowledge—often characterizes the richest interdisciplinary work." (Seipel 2005)[7]

What this means for the discipline of 'music technology'– if there ever was one – is that we have to admit to ourselves that the separation of this discipline into its three distinct boundaries, as mentioned before, has more to do with *how we do* something than with *what we do*. Or, in other words, more to do with which methodologies are more similar and which ones are not. The reason for one sub-discipline, such as electro-acoustic composition, to be more accepted in music departments is not that it is 'more musical', nor that it is 'less technical'. It is that the methodologies for working, teaching and researching in this sub-discipline are more similar to the ones used in departments of music across the country. The same can be said of music informatics and computer science departments. Music informatics has as much to do with music as with informatics. But its methodologies just simply do not seem to fit into traditional music departments. (Boehm 2007:18)

8. Mending some gaps

Until recently interdisciplinarity was "the most seriously underthought critical, pedagogical and institutional concept in the modern academy", and in 2006 we still, as Sperber says, do not, normally, discuss among ourselves interdisciplinarity per se. What we do is work on issues that happen to fall across several disciplines, and, for this, we establish collaboration (see Liu, in Sperber 2005).

> "Interdisciplinarity has been said to be the modern 'motherhood and apple pie' issue. That is to say, everyone, including decision makers in higher education, recognizes that it is a Good Thing. It has 'become a buzzword across many different academic subjects in recent years, but it is rarely interrogated in any great detail." (Moran 2010: 1).

But providing that we accept postmodern fragmentation, there also needs to be a willingness to create new methodologies where interdisciplinary enquiries indicate that they are needed, rather than use "predetermined (…) form(s) of discipline-bound theories, methods, and schools of thought" (Mourad 1997).

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[7] Marilyn Stember, "Advancing the Social Sciences through the Interdisciplinary Enterprise." Interdisciplinarity: Essays from the Literature, William H. Newell, editor. New York: College Entrance Examination Board, 1998: 337–350, at p. 341.

An example of a new methodology, as always academically controversial, is the emergence of PaR methodologies, appearing in various visual arts, design, music and performing arts disciplines. Jane Linden, in her thesis about PaR, maps these developments from the 1970s onwards:

> "Carol Grey identifies the 'first generation' artist researchers in Art & Design, emerging in the 1970s and 80s, who saw the potential to develop practice 'through the process and framework of higher degrees'. As early as 1989 the UK Council for National Academic Awards (CNAA), had extended its research regulations to include 'artefacts/artworks (elements of practice) as part of a submission for higher degrees, legitimising practice and not only "reflection on practice" as a research activity" (Grey, in Linden 2012)

The exponential rise of practice-as-research can be seen as a consequence of various HE policies. The Further and Higher Education Act of 1992 put the former polytechnics - with their more vocational and practice-based cultures - into the same framework as the old universities with their perceived predominantly academic provisions. The word 'perceived' is important in this context, as explored above, as they have come to be *perceived* as academic only since the 18th century and were reinforced as academic by the rise of the Humboldtian model of a university, which was accepted by most European and American universities. That the English and Scottish (and Irish) ancient universities have more recognisable remnants of their medieval origins may in some way also explain the British wider acceptance of the 'practice-based' in university contexts, as exemplified by music composition, drama, dance or creative writing. Whereas in the UK composition is taught in ancient and red-brick universities, in Germany it is predominantly taught in conservatories and music colleges.

PaR could be defined as Linden does, using a definition derived by the Higher Education Academy:

> **Practice as Research** = research activity in which disciplinary practice – normally arts/media/performance practice – is an integral part of the research method and outcome (in the form of documented processes and/or products) of an articulated and positioned research inquiry. (Linden 2012)

In this it stands in opposition to the more common practice-based research:

> **Practice Based Research** = an alternative to traditional academic research. In this type of research, research methods, questions and outcomes are directly derived from and applied to issues of direct relevance to the field.

Thus PaR acknowledges the significance of a direct engagement from within the practical activity as an integral part. What is often called a dialogical relationship between the practice on the one hand, and the conceptual and critical frameworks on the other, is integral to PaR. In this, it does have resemblances to methodologies such as action research. It also has a close affinity to a concept that a former colleague and I have written about. Derived from digital innovation within the arts, the practice of developing technologies to support creative ends is in a dynamic dialogical relationship to the artistic concepts. Here, not the phrase 'praxis' is used, but 'creative pull' and this term was explored in a whole conference in 2001 around the concepts of 'Content Integrated Research in Creative User Systems' or in short CIRCUS:

> "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. (Patterson and Boehm 2001)

In the centre of these problems stand the challenge of content, medium and technology (see Boehm 2002) and this tripartite maps easily onto the framework for PaR with the conceptual ideas (content) standing in a dialogical relationship to the practice (technological tools and their development).

Back in 2001 it related more to the needed balance of 'Creative Pull' vs the then more predominant 'Technology Push'. But the concept of creative pull has more complex implications that are still current today, and can be seen in a PaR context. So for music technology this includes (and compare Boehm 2002)

Creative Pull (from Boehm 2002)	PaR and Praxis, related to the subject area of 'Music Technology'
Content, Aim of technology development Theory Technological development Stuff created by creative technology developments	Conceptual ideas Theoretical Framework Practice Artwork
• 'integrating the creative user from the start of an application developing process, instead or attaching him as a service or as an end user'	• No/less distinction between technology developer and technology user. Creatives in the area of music technology are more often knowledgeable in both than not.
• 'providing frameworks for letting the interaction between creativity and the development of technology happen throughout all phases of project development '	• Technological development and artistic process to be in a dialogical relationship
• 'providing production methodologies or business models to cope with situations in which creativity pulls the development of technology, along with the inherent dilemma best described as "building the camera while making the film" (Phrase coined by Dr. John Patterson, University of	• Utilising reflective documentary processes to navigate the dynamic of development of both theory and practice.

Glasgow, in the beginning of the CIRCUS working group, 1998)	
• 'providing the framework in which individuals artists can participate in research projects, without the need of membership to academic institutions'	• PaR accepted as a valid research methodology

The reasons why the concept of 'creative pull' (as well as the concepts around PaR) is more complex than the simple term suggests was expressed by Patterson's phrase "building the camera while making the film" (Patterson, in Boehm 2002); the development of practice vs theory/criticality in a 'creative pull' project (or PaR project) - although ideally in constant dialogue with each other - often does not move in the same speed. If the technology/practice advances too much, it becomes technology push (or too practice focussed). If on the other hand the conceptual, critical and theoretical developments advance too far ahead, it becomes merely a brain game, a theoretical exploration, a creative exercise in ideas only without the needed underpinning practice.

This difference in pace of development creates a number of challenges. It creates a stop and go process that needs to be constantly negotiated. Additionally, we find this process hard, as through our learning environments and disciplinary structures we are not used to engage in enquiries that include both the practical AND the theoretical simultaneously. Choosing one or the other seems the easier way. The guidelines for writing pure dissertations, or creating a compositional portfolio are much easier to understand, easier to navigate than doing both simultaneously and putting them into a meaningful dialogue with each other. However for those subject areas within the creative arts that did not have the fortune of having a 100+ year history of music in academia, PaR is one of the few ways to consider creative practice a valid a research activity, as is writing a scholarly dissertation.

Documentation then becomes essential in those art forms that are ephemeral and poses another challenge; how to capture the process, the artefact and the dialogue in-between?

"The practice as research descriptor states clearly that 'outcomes' of research can be considered through 'documented processes' as well as 'products' – which suggests that the knowledge value of the research undertaking is positioned through and within the activity itself and not simply through objects/artefacts in relation to a specific field of inquiry. It is significant then to consider practice as research (…) as exactly what it declares itself to be – a distinct methodology that has fundamental regard for a close, and experientially derived, research praxis." (Linden 2012)

Thus, in its essence, PaR has the ability to close the gaps between the practice and the 'academic', and thus addresses and simultaneously elevates the formerly perceived vocational for many ephemeral performance disciplines (such as live arts, dance, songwriting, acting). In a country such as the UK, where the creative sector has flourished in industry as well as HE, it is no wonder that this new methodology has been welcomed with open arms.

Beyond the performance disciplines, this explicit making of something ephemeral is of significance. This practitioner-centred methodology could be seen as a rigorous method for many other disciplines where it might of value to bring in the practitioner's insight into an enquiry. It seems to re-connect the more medieval ancestry of practice-oriented disciplines such as medicine and divinity, with a more contemporary research methodology that does not ignore more postmodern notions of impossible objectivity. The practitioner-researcher herself/himself is an explicit part of the methodology. PaR thus provides a crucial solution not only for enquiries in the arts, but for all knowledge enquiries where the experience of the practitioner is in a dialogical relationship with various contextual and conceptual frameworks.

9. Conclusions

The British HE sector is known to live in a constant climate of change. For better or for worse, there is no other country in Europe which has had more governmental policy changes imposed on universities than the UK. It has had to adapt, grow, shrink, change and shift every time a significant change in policy was introduced. Of course this might be the result of the UK political adversarial two-party system supported by first-past-the post voting and it is interesting to note that those HE sectors that are considered more stable are in countries where more representative voting systems are utilised with more incremental policy development. But UK Universities have always stepped up to the challenge, with only some smaller institutions stumbling along the way. The sector is amazingly resilient, and I for one feel that it still demonstrates the value that universities hold for society as a whole.

As advocated in this article, I believe that the biggest challenges we face today are of an interdisciplinary nature, and although our research cultures have easily adapted to this (with some slower but nevertheless steady progress in the structures of funding research), we are challenged by our undergraduate learning provisions which still have disciplinary cultures in place that stem from the last century. They mirror what happens in secondary education, and it is here that more courageous attempts to break the disciplinary divides need to happen.

Music technology itself, in all its guises, is flourishing as ever. It has become a part of the educational establishment and, as a subject, a pillar of our economic wealth. That a subject area such as this should have a hard time establishing itself as a discipline (there is no such thing as a music technologist) has rather to do with university structures and the nature of disciplines as social constructs.

I, for one, have somehow come to the conclusion that in the case of music technology, it does not matter what part of which area is taught where, whether electro-acoustic/sonic composition is taught only in music departments, music informatics only in computer science departments, or sound engineering predominantly in music colleges.

What matters more is that HE institutions and research cultures have to adopt a more open stance towards methodological choices, that researchers need to be taught the cultures and histories of disciplinary divides to free them and give them confidence to chose methodologies that are appropriate to the enquiry, and that these "would emerge in the course of the inquiry rather than be predetermined in the form of discipline-bound theories, methods, and schools of thought" (Mourad 1997) .

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