**Goldsmiths Digital: Research and Innovation in the Creative Economy**

**Introduction**

Academic research, in its purest form, is about changing how we understand the world. Sometimes this involves an entirely new philosophical, logical, or aesthetic principle. On other occasions, it sheds light on how different types of existing knowledge can combine. Or it may be characterised by new observations emerging entirely by accident, and that we as yet cannot explain.

In general, we understand innovation differently. We might say that innovation is about changing the way things are. The concept of innovation brings with it the notion of a new way to do something - not just a new way to understand it. In this sense, innovation implicitly requires practical outcomes and impact. This impact can be in any area, even the nature of research itself.

It is clear that academic institutions should be active in both research and innovation. The 2015 Dowling Review of Business-University Research Collaborations states that ‘use-inspired research’ drives new insights in fundamental research, and that greater funding of collaborative research and development, supported by ‘pump-prime’ funding, is required in order to deliver improved economic impact and more valuable research in general. It also states that the current strategy is not well coordinated[[1]](#footnote-1).

However, there have been some attempts to explore how collaborative R&D might work better. In the past few years, projects such as Creativeworks London, and other similar, related enterprises including London Creative and Digital Fusion, and the NESTA, AHRC, ACE Digital R&D fund, have provided excellent opportunities to explore and better understand how institutions can more effectively collaborate with non-academic partners.

In 2014, in direct response to these opportunities, I set up Goldsmiths Digital, a research-led practice initiative to provide consultancy and contract research services to the Creative Economy sector, the primary outputs of which would be software and hardware prototypes.

In order to better understand the motivation behind this decision, and what has been learned as a consequence, it is important to have a more complete understanding of what is meant by the ‘Creative Economy’.

**What is the Creative Economy?**

Of the 32 million jobs in the UK, more than 9% of them are classified as existing within what is described as the ‘Creative Economy’, with approximately 28% of these being in London[[2]](#footnote-2).

More than half these jobs are regarded as existing within the core Creative Industries. They alone contribute an estimated £71 billion per year to the UK economy. In fact, the Creative Industries have been growing approximately three times faster than the entire UK economy in recent years, outperforming almost every other sector.

This is a success story, especially when one considers that the financial services sector, itself in receipt of over £1000 billion in public funding between 2007 and 2010[[3]](#footnote-3), is shrinking by as much as 10% each year.

The Creative Economy incorporates advertising, marketing, architecture, crafts, design, film / TV, publishing, museums, galleries, libraries, music, performing and visual arts, and information technology. Of all fields that form part of the Creative Economy, the largest in terms of jobs is information technology, software and computer services, otherwise known as the ‘Creative Technologies Sector’.

The Creative Technologies sector represents almost one third of all Creative Economy jobs. It is also directly responsible for almost half of all economic value in the sector, contributing over 30 billion per year to the UK economy, and almost half of all Creative Economy exports.

Given the high impact of technology across the Creative Industries, it is fair to assume it has a large indirect effect on the Creative Economy overall. For example, music technology is worth the same in economic terms as the entire recording industry it supports. Similarly, TV, film, advertising, marketing and design, depend on outputs from the Creative Technologies sector, with digital marketing being a core aspect of contemporary business growth.

One might argue that given the positive performance of the Creative Economy, Creative Technologies are a significant, driving force in the UK. What is certainly true, is that the importance of the Creative Technologies sector can be easily underestimated. What is perhaps worse is that, in academia at least, we are not entirely sure what Creative Technology is, or how we should encourage it.

**Understanding Creative Technology**

It is more or less straightforward that Creative Technology is a core part of our economy. However, it is also clear that Creative Technology is an interdisciplinary practice. This makes it very difficult for academics to understand what it is, because usually, academics exist to explore known areas of research within traditionally accepted disciplines.

What is perhaps more problematic, is that it operates across the boundary of science and art. In the field of Creative Technology, there is perhaps no difference between a professional flautist, and a computer programmer who makes music. In each example, they rely on advanced knowledge of challenging techniques to create art. On the one hand, programming a computer, and on the other, manipulating a complex acoustic device. And sometimes she does both at the same time.

I argue that the separation of art and science in our culture is a core reason for our inability to understand Creative Technology. This divide has both produced, and is also reinforced by, perverse incentives impacting upon academic research. One such incentive is the perceived meaning and value of research in different academic fields - a subject of recent reification across academia, both by the 2014 REF (Research Excellence Framework), and studies such as the AHRC cultural value project. For example, I have said that the Creative Technologies sector is one of singular importance to the UK economy. However, it is not clear that we are able to reward best practice in this field in the same way as in other academic fields. Conversely, it is arguable that we absolutely should. So who do we incentivise to generate academic research and innovation in Creative Technologies?

**Incentivising Creative Technologies Research**

One might assume that we incentivise and reward computer science via the Research Excellence Framework for its contribution to the field of Creative Technologies. However, an analysis of the 2014 REF results demonstrates that applied, interdisciplinary fields of computer science, including those specifically intersecting Creative Technologies, were generally not considered as being of high quality. Alan Dix, a respected member of the 2014 computer science REF panel, has demonstrated it is orders of magnitude harder to get an academic output rated as world leading in fields intersecting Creative Technologies, than in all other fields of computing[[4]](#footnote-4).

Therefore the REF does not reward academic innovation in fields of computing that are currently driving Creative Technologies. Instead, such innovation is penalised because it is not seen as core to the discipline, and not sufficiently scientifically motivated. It cannot be assumed that this view is as prevalent at research council level with respect to computer science and engineering (within the EPSRC for example). However, it is more or less clear that the REF represents the views of the academic community, and that the academic community is responsible for evaluating grants. Therefore, it may well be the case that Creative Technologies research and innovation, unless entirely articulated within specific fields of computing or engineering, may struggle to be rewarded.

One might also assume that Creative Technologies are incentivised and supported by the research councils through Innovate UK. There is some truth to this. For example, Innovate UK has specific Creative Industries funding calls that seek to cement alliances between research organisations and creative business, to drive innovation. However, SMEs operating in Creative Technologies sectors, specifically those working on software and services for the Creative Industries, might struggle to find time to apply for funds, and what is more, might be unable to find the required 50% match funding in order to satisfy the eligibility criteria.

In the case of the Goldsmiths Digital Firef.ly project, where the Creative SME was unable to meet the match funding requirements, they were able to raise the remaining 50% through the organisation of their own crowdfunding campaign. As part of this campaign, it was advertised that they had already raised half a million in funding from Innovate UK. However, strictly speaking this was not in fact true. If they had failed to meet their funding target as part of their campaign, their Innovate UK funding would have been withdrawn.

So it is not clear that Innovate UK incentivises innovation in the Creative Technologies sector very well. In Paul Nurse’s review of the research councils, he supports Dame Ann Dowling’s view that the process is too complex and difficult for SMEs to engage in[[5]](#footnote-5). Both Nurse and Dowling state that greater interdisciplinary collaboration, including between the research councils and Innovate UK, is necessary. Further to this, Nurse recommends that the current portfolio of grants be further restricted to a series of loan opportunities. Although this does not disadvantage academics directly, it does not incentivise them, and may make it more difficult for them, and their partner SMEs to benefit from such schemes in the future.

On the other hand, it is possible that there are those in the Arts and Humanities who fear that creative technologies may represent ‘science by the back door’. Creative Technology requires programming, and programming is traditionally seen as an approach that engineers and scientists take to conducting their research. However, one only needs to briefly browse kickstarter.com to see the indelible impact creative coding and the maker movement are having on culture.

The AHRC’s cultural value project report does not represent either of these movements as significant areas of culture it the arts or humanities. Nor are there many practical, innovation-specific outcomes in Creative Technologies specifically funded by the project. It must be understood that the focus of the AHRC cultural value project and its associated report is on cultural value specifically[[6]](#footnote-6). However, it does not draw significantly from the impact Creative Technology is having in the arts generally, and this might be interpreted as an unwillingness to engage with overtly technical forms of culture, and by extension, innovation in general. However, my own research in creative technology has been well supported by the AHRC in the past, and so I would argue that this is possibly just an oversight caused by the need to represent the vast range of diverse research across the arts and humanities.

It seems that the research community is unclear regarding how it might best support and incentivise interdisciplinary work that sits at the intersection of art and science. Given that this is precisely where research and innovation in Creative Technologies are placed, and the contrast with respect to their importance to the UK economy, it is fair to say that anything we can do to incentivise such work brings great benefits to the academic community, the economy, and society generally. As such, academia can align its research evaluation, innovation and incentivisation processes with what is happening outside academia.

**Goldsmiths Digital**

As I have already mentioned, Creativeworks London and associated schemes represent an attempt to do precisely this - align academic research with external partners for the purpose of innovation. The philosophy of awarding small amounts of funding to seed a large number of projects might easily be shown to result in failure, as many projects will undoubtedly come to nothing. However, in the case of Goldsmiths Digital, these opportunities enabled me to embark upon a project to better understand how we might more effectively align our research and innovation processes with what is happening in the marketplace.

In fact, Goldsmiths Digitalhas been a very successful commercial endeavour, substantially supported by Creativeworks London and related initiatives. It has generated over £210,000 in commercial income, creating over £70,000 in student bursaries, and £44,000 for temporary staff. Much of this funding came from Creativeworks London and London Fusion. Further to this, it directly led to substantial FEC grants: NESTA digital R&D project Soundlab worth £130k, InnovateUK project firef.ly worth 500k, and the European Commission Innovation project RAPID-MIX, worth €2.2million. It has also resulted in the creation of spin-out companies, successful crowdfunding campaigns, and a US interface design patent. Creativeworks London, and other related AHRC initiatives, have been a very important part of this success.

The Goldsmiths Digital project began with the definition of three specific definitions of purpose: Understanding the Gap, Prototyping as Research, and Generalised Accessible Design.

Understanding the Gap

This area of focus emerged from the understanding that, as has already been mentioned, academic research in both the sciences and humanities can often fail to find impact in the public eye in terms of economics and culture. Goldsmiths Digital seeks to understand and express the nature of the gap between what the academic community considers excellent research, and what is considered useful by industry and the wider public. It is my aim that such an understanding will aid in the development of future research that more successfully meets the needs of public funding initiatives. In addition it is intended that this work will underline the need for greater public funding in pure research, without compromising in quality, whilst also developing a better understanding of the requirements of innovation.

Prototyping as Research

Prototyping is an effective research method that can lead to innovative outputs of high value and high impact. Goldsmiths Digital aims to treat prototyping as a form of research in the wild, articulating notions of research-led and research-informed practice through the paradigm of the prototype. Prototypes are evaluated using a range of appropriate and existing methods. In addition, emerging evaluation methodologies, such as industry-focussed, iterative user-centred design, form a core part of our research agenda.

Generalised Accessible Design

We treat research in accessible design as a real-time, in the wild method for the production of better prototypes. Working with disabled and non-disabled communities equally may lead to innovations that are more easily reproducible, more easily deployable, and therefore more effective. This follows on from our existing research exploring how ‘trickle up’ design research, where users with very specific interaction needs help to evaluate the usability of prototypes for non-disabled users, leads to more deployable and usable creative technology.

These three areas of focus continue to act as guiding principles for Goldsmiths Digital. However, they are not intended to be all encompassing or prescriptive. Instead they should be regarded as starting points for articulating an approach to research and innovation in creative technologies.

In some cases, the larger-scale Goldsmiths Digital projects, such as the Digital R&D funded *Soundlab Framework[[7]](#footnote-7)* collaboration with Heart n Soul[[8]](#footnote-8), eventually came to embody these principles entirely. For example, *Soundlab Framework* has operated a user testing service for mainstream Music Technology companies, providing feedback on their products from musicians with physical and learning disabilities. *Soundlab* also won the 2016 Music Teacher award for best Special Educational Needs Resource. It additionally led to the publication of a conference paper at SIGCHI 2015, representing the first time Interactive Machine Learning had been used to create interfaces for the disabled[[9]](#footnote-9).

*Soundlab* grew out of the Creativeworks London project, *Cheeseburger Man*. It is worth exploring this project as a case study, as it effectively demonstrates how partnerships brought about through such funding can lead to larger scale outcomes. In addition, it is useful for understanding the challenges involved in Creative Technologies development.

**Creativeworks Case Study: Heart n Soul**

*Cheeseburger man* was a Creativeworks London project. The goal was to create a brand awareness remix app to support the release of an album by *The Fish Police[[10]](#footnote-10). The Fish Police* are a band fronted by autistic rock star, Dean Rodney, who works closely with Heart n Soul, the Deptford based disability arts charity. I continue to enjoy a fruitful association with Heart n Soul due to my collaboration with them on the 2012 Paralympics *Unlimited* exhibition, *The Dean Rodney Singers[[11]](#footnote-11).*

*Cheeseburger man* involved the design and delivery of an iPad app that would allow users to interactively remix a *Fish Police* recording, and upload their remix to a website. The fundamental resource required to complete such a project is a creative programmer. Furthermore, you need a creative programmer who is able to understand the importance of the design process. As a researcher with a focus on exploring prototyping as a method of research, and as course leader for the only Creative Technology degree programme in the UK at the time, this was one resource I was confident I could find.

The total cost of producing this sort of app in the commercial marketplace is approximately £40,000. Therefore, we were committing to create the same identical experience that you might get for that price, but for only 25% of the cost. This is of course a challenge. However, this challenge would allow us to test the robustness of our creative application development framework, which we specifically developed for such a purpose. This effectively aligned our goals with that of the project partner, allowing us to prototype and further refine our development framework.

The most important aspect of the project, as with all technology projects, was establishing an appropriate level of scope with respect to the desired features. The reason such a project would normally cost £40,000 is precisely because that is how much it costs to pay a creative technology developer to design and build an app. Our existing framework would simplify the process of development. *Heart n Soul* would take care of marketing and launching the app.

Feature Creep

What we were desperate to avoid was the inevitable negative impact of ‘feature creep’, which occurs in all projects of this kind. ‘Feature creep’ is the single most destructive element in all technology collaborations. It is often caused by the lack of understanding people can have - scientists, artists and entrepreneurs alike - with respect to the complexities of software development.

Software requires significant planning, and is a deeply time consuming process. Once a decision is made regarding the requirements for all specific functions, a time cost can be calculated. This is usually measured in days, and can only be an estimate based on how long each function will probably take to implement. If new functions need to be added part way through implementation, this can sometimes result in an entire rewrite of all the software, potentially from scratch.

It is perhaps easier to understand why this is if you compare the process to building a house. Once it has been decided where everything will be placed, foundations can be laid, walls constructed, windows, doors and roof added, plumbing, gas, electricity, flooring and furniture fitted. If you then decide to move a room, this might mean that the build could take three times as long. It may in fact require a change to the foundations. It is of course unethical to expect this work to be done for free, so it should be assumed it would also cost three times as much.

The Specification

In order to prevent such disasters, it is usual to agree a specification, at least in principle, before any software is written. This is particularly the case for projects with a limited budget, as it is much more likely that you will run out of money.

It must be stressed, that in my entire career as a creative technologist, agreements over specifications represent a crucial point of failure. That is to say, when relationships break down between partners, it is almost always, without fail (except in circumstances where your staff go missing), due to the client partner either refusing to agree to a specification (for example, attempting to delay decisions about how software should function until after it has been built), or attempting to engineer some means by which they can alter the specification after it has been agreed, or worse, after work has already begun. This is nothing to do with the difference between academia and industry, science and art, or individual disciplines - it is identical across all such boundaries. Clients will always attempt to force developers to build software outside of what was previously agreed. They almost universally feel they should be able to improvise new features during every phase of the development process. Imagine that a client was behaving this way whilst you were building their house, and you get a little closer to seeing the problem.

My hypothesis was that rapid development frameworks, combined with quick prototypes, might offer a suitable starting point for mitigation of this issue. The hope was that our framework would absorb some of the pain by making it possible for us to rapidly prototype the application in between phases of user testing. As a development approach, this worked very well, and we now use this as a core technique in our research. However, it was only the case because we had spent the previous three years working on a framework to support precisely these sorts of creative application development issues.

Evaluation and Reflection

The project was a success in the sense that the final app was loved by the people we made it for. We followed a user-centred design approach, with iterative development and rapid-prototyping based on our framework. The app ended up with some great features, and drove development in our prototyping research. We also used what we learned to successfully apply for further funding.

However, our framework, although successful in delivering the app, did not prevent all the pain. Specifically, there were some features that we could not anticipate, and as a result, these needed to be built from scratch. Also, we found that the amount of time required to build and maintain such a framework was a significant cost. It is likely that, for most developers in Creative Technology fields, where appropriate RAPID frameworks are not available, very tight specifications will remain necessary.

It can also be argued that just because you have tools that speed up your development, this does not mean that clients should feel more relaxed about demanding regular changes to agreed specifications, or refuse to sign off materials that have already been agreed in principle. These are clearly bad business practices that result from inexperience across UK academia and industry with respect to technology development in general.

However, we found that the basic principle did save time and money. Goldsmiths Digital went on to develop a number of core technologies that were then used in the deployment of a range of similar projects across the creative sector. It was not always possible to repurpose everything, and new technology had to be continually developed, but the main result was an ever-growing repository of deployable, re-usable software elements.

A great deal of our current work is now in the creation of frameworks that speed up the development process in order to provide more flexibility at the prototype stage. In particular, we have identified a number of desirable software features which are difficult to engineer, and are working to make these more accessible to more people. This is the rationale behind our Horizon 2020 innovation action, RAPID-MIX, for example. As a result, our machine learning systems are now being used as rapid development tools by Google, Microsoft, the BBC, and many others.

I would propose that the needs of a great many SMEs could be met in this way. In particular, where funding policy dictates that public funds support a small number of UK SMEs to develop their products in areas that are largely similar, such as big data for example, it would be wise to support teams of experienced academics to develop core frameworks that provide said functionality and demonstrators to as wide a community as possible.

Such frameworks could then be licensed and promoted to a much larger number of SMEs, accelerating growth and competition in the marketplace around policy-critical innovations, instead of simply supporting one SME with a large grant. This would cost the same, or possibly less in terms of public funds, but could have a much wider benefit across the industry. It would also allow academic institutions with the right experience to diversify their income via licensing.

**Conclusion**

Funding such as that offered by Creativeworks London has been vital to the success of the Goldsmiths Digital project. The initial project preceded approximately 40 further collaborations, leading to a high number of innovation outcomes, and further funded research with organisations such as Heart n Soul and many others including Google and Microsoft.

Goldsmiths Digital continues to grow. We are about to employ a Project Coordinator to handle communications with clients, and manage staff. Goldsmiths as a whole has been hugely supportive of the initiative, and it is hoped that new staff will grow the business to aid income diversification, a core element of our developing academic future.

However, what is unclear is precisely how the wider academic infrastructure should incentivise and reward such success in the future in terms of quality assessment and funding.

The barriers separating traditional academic disciplines, dividing the arts and the sciences, remain in place. These barriers perversely incentivise narrow fields of research that lead to largely abstract outcomes, widening the gap between research and innovation.

Whereas in engineering, practical outcomes may be celebrated, in the arts they are denigrated, and work in the intersection of arts and computing is rated amongst the least important in the sector.

Yet, this offers a poor parallel to real-world economics. As such, academia cannot account for or understand innovation that depends on creativity and technology in equal measure, yet this is a driving force in our economy.

But there may be light at the end of the tunnel. Academic research, in its purest form, is about changing how we understand the world. Sometimes this involves an entirely new philosophical, logical, or aesthetic principle. On other occasions, it sheds light on how different types of existing knowledge can combine. Or it may be characterised by new observations emerging entirely by accident, and that we as yet cannot explain. You can often find such things right under your nose.

1. <http://www.raeng.org.uk/publications/reports/the-dowling-review-of-business-university-research> [↑](#footnote-ref-1)
2. <https://www.gov.uk/government/statistics/creative-industries-economic-estimates-january-2014> [↑](#footnote-ref-2)
3. <https://www.nao.org.uk/highlights/taxpayer-support-for-uk-banks-faqs/> [↑](#footnote-ref-3)
4. <http://alandix.com/ref2014/> [↑](#footnote-ref-4)
5. <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/478125/BIS-15-625-ensuring-a-successful-UK-research-endeavour.pdf> [↑](#footnote-ref-5)
6. <http://www.ahrc.ac.uk/documents/publications/cultural-value-project-final-report/> [↑](#footnote-ref-6)
7. <http://www.makeyoursoundlab.org> [↑](#footnote-ref-7)
8. <http://www.heartnsoul.co.uk> [↑](#footnote-ref-8)
9. Simon Katan, Mick Grierson, and Rebecca Fiebrink. 2015. Using Interactive Machine Learning to Support Interface Development Through Workshops with Disabled People. In Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15). ACM, New York, NY, USA, 251-254. DOI=<http://dx.doi.org/10.1145/2702123.2702474> [↑](#footnote-ref-9)
10. <http://www.thefishpolice.com> [↑](#footnote-ref-10)
11. <http://www.heartnsoul.co.uk/category/artists/details/dean_rodney> [↑](#footnote-ref-11)