

UNWEAVING THE RAINBOW: RESEARCH, INNOVATION AND RISK IN A CREATIVE ECONOMY

Issue

1. To examine the relevance of existing definitions of research and development (R&D) and innovation within the context of the creative industries (CIs).

Recommendations

2. Members of the Task Group are invited to:

i) note the limitations of the current classification framework for R&D and innovation for the creative industries and the academic research base;

ii) consider how a broader understanding of R&D and innovation may be developed, demonstrated and utilised to inform policy and enable appropriate support structures for knowledge transfer.

Background

3. It is widely acknowledged that the UK economy must secure its future competitiveness and prosperity, not through investments in physical capital but through the generation and creative exploitation of new knowledge. The current Western political discourse advocates the supported advance of knowledge based industrial sectors over the primary and secondary industrial base of the previous century, with the CIs positioned centrally in this terrain as pivotal to the nation's economic and social well-being. The economic paradigms of this agenda are made all the more pressing by the global context. Fast advances in research based activities in countries such as India and China are increasing the pace of the European knowledge race, evidenced in the Lisbon Strategy that aims to make the European Union "*the most dynamic and competitive knowledge economy in the world by 2010*"¹, and highlighting the fact that simply generating knowledge is insufficient in isolation; it's what you do with it that counts.

4. The two pillars of knowledge generation and application are taken to be R&D and innovation and, while it should not be assumed that there is necessarily always a causal or linear relationship between the two, it is thought likely that increases in available new knowledge will lead to new advances in the private sector that will have positive ramifications in both economic and social spheres. In response to this agenda the UK government at a national level, under the remit of the Department of Trade and Industry (DTI), has increasingly invested in support for industry R&D activities and has rationalised previous innovation support products into Knowledge Transfer Partnerships (KTPs), a Technology Programme, Grants for Research and Development delivered in England through the nine Regional Development Agencies (RDAs), and R&D Tax credits.

5. In parallel UK Higher Education Institutions (HEIs) are encouraged, as agents of new knowledge, to engage with industry and other non-academic sectors. This work is supported by the Higher Education Funding Council (HEFCE) through the Higher Education Innovation Fund (HEIF), with equivalent structures in the Devolved Administrations (DAs), and through targeted funding support from the seven Research Councils (RCs) funded by the Office of Science and Technology (OST) that have a remit to support Knowledge Transfer (KT) in order to maximise the benefits of publicly funded research.

¹ A New Start for the Lisbon Strategy, September 2005, European Commission, www.europa.eu.int/growthandjobs/index

A Question of Definition: R&D

6. Given the high level of investment and interest in R&D and innovation as key drivers of the knowledge economy it is notable that less attention seems to have been given to exploring what activities these concepts might entail in the 21st century across the diverse range of enterprises that are considered to be knowledge-based industries. The development of such an understanding would assist in ensuring that the support mechanisms reflect and enable the reality of practice in these sectors.

7. The definitions of R&D and innovation that underpin UK government support instruments for these activities are derived from the Organisation for Economic Co-operation and Development (OECD) *Frascati*² and *Oslo*³ manuals respectively with both documents designed to provide guidance on the collection and measurement of national R&D and innovation outputs.

8. The *Frascati Manual* was first published in 1963 and defines R&D as follows: *"Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."*⁴

The manual also defines the three activities that constitute R&D as:

Basic Research: experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.

Applied Research: also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.

Experimental Research: is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products and devices, to installing new processes, systems or services or to improving substantially those already installed.

A Question of Definition: Innovation

9. First published in 1992 and revised in 1997, the *Oslo Manual* focuses on a narrow definition of innovation based on a partial borrowing from the neo-Schumpeterian model⁵ and focusing only on technological innovation in the business enterprise sector which results in a classification of innovation as *"Technological Product and Process Innovation...with changes that involve a significant degree of novelty at the level of the firm."*⁶

10. Whilst the second edition of the manual was revised partly to provide for inclusion of what are deemed to be "service industries", namely the software, travel and financial services sectors referenced as examples in the document, the changes do not go much beyond expressing the problematic of shoehorning these

² Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development, OECD, 2002 (sixth edition).

³ Oslo Manual: The Measurement of Scientific and Technological Activities. Proposed Guidelines for Collecting and Interpreting Technological Innovation Data, OECD, 1997 (second edition).

⁴ Frascati Manual, 2.1, 63, p 30

⁵ Capitalism, Socialism and Democracy, Joseph Schumpeter, 1942

⁶ Oslo Manual, 3.3, p8, OECD, 1997

sectors into the existing framework. The main difficulties, accurately listed in the *Frascati Manual* may be summarised as:

- service innovation is often immaterial in nature and therefore difficult to protect;
- service industry firms tend to be smaller than those in manufacturing and less concentrated;
- not all service industries are the same and may innovate differently and serve different markets;
- there is a lack of robust statistics as a background for the measurement of innovation for industries that are not directly related to handling goods.

Whilst recognising these problems and acknowledging that:

*" ..some of these industries are economically significant as well as being instruments of technological and social change. These industries include communications, finance, insurance and real estate, entertainment and business service."*⁷

the adopted approach appears to involve persistence in finding a way to include these sectors within the existing framework rather than question any emerging disparity between a system that was based on an understanding of industry in the last century and the practices of the industries at the forefront of the knowledge economy.

Invisible Industries and Invisible Interfaces

11. The overarching definitions of R&D referenced above in themselves do not necessarily present immediate barriers to the creative industries or to knowledge exchange between the private sector and the entire available academic research base. The further underpinning systems of classification employed in the *Frascati Manual*, which are then built upon in the *Oslo Manual*, however would appear to be rather more challenging in this respect.

12. The complexity of both of the manuals should not be misrepresented and it is acknowledged that an in depth analysis of the whole matrix of measurements of R&D and innovation is beyond the scope of this brief paper but there are two key areas of potential concern worth highlighting here:

- the classification of industry sectors;
- and the perceived mismatch between the classification of these business enterprise sectors and the academic classification of disciplines.

13. The definition of industry sector employed by the *Frascati Manual* is based upon the classification of significant industry sub-groups using the International Standard Industrial Classification (ISIC, Rev.3.1) referenced at *Annex A*. The majority of CIs currently feature somewhat inadequately under the category of *Community, social and personal services activities, codes 75-99* with the result of both obscuring any real understanding of the core business activities of these industries and implicitly and uniformly categorising them as entirely service based businesses with little direct commercial relevance. Whilst the ISIC classification has recently undergone a revision which is expected to be adopted in March 2006, the existing classification has impacted upon not only the current measurements of R&D and innovation but also upon the associated support structures implemented at national and regional levels.

⁷ Oslo Manual, 127, p30,

14. The sub-classification of the higher education sector is listed as six major fields of science and technology as follows:

- Natural Sciences
- Engineering and Technology
- Medical Sciences
- Agricultural Sciences
- Social Sciences
- Humanities

In addressing the last category within the three activities of basic, applied and experimental development as defined above the *Frascati Manual* states that:

“Experimental development ...has little or no meaning for the humanities.”⁸

The document then follows on from an earlier outline of the perceived problems pertaining to R&D in both the services sectors and the humanities in saying that:

“Identifying R&D is more difficult in the service industries than in manufacturing because it is not necessarily “specialised”. It covers several areas: technology-related R&D and R&D in the social sciences and humanities.”⁹

15. The combination of these two areas of classification alone gives rise to an issue that is central to knowledge transfer; that of an invisible interface. This interface is comprised of industries with R&D and innovation activities that evade current measurement within the existing framework due to their inconvenient combining of types and sources of knowledge and an academic set of disciplines that are situated, without any supporting evidence, as being irrelevant to experimental development activity, and therefore by implication, of little consequence to the private sector. This analysis, as noted previously, serves only as a sample indication of how an embedded framework of definitions in this terrain may inadvertently position both the CIs and arts and humanities research outside of the R&D and innovation agenda. Theoretically, this fictionally constructed invisible interface, devised by classification, combined with an inability to assimilate interdisciplinary use and sources of knowledge significantly undermines the majority of knowledge transfer funding initiatives for both the CIs and the arts and humanities research base. In practice, the issues are visibly played out in existing innovation support products in the UK.

R&D Tax Credits: a case study of definitions in practice

16. The current Treasury consultation on R&D Tax Credits, *Supporting Growth in Innovation: enhancing the R&D Tax Credit*¹⁰ provides a useful starting point to examine how the above definitions translate into policy and support products for R&D and innovation. The R&D Tax Credit was first introduced in 2000 for Small and Medium Enterprises (SMEs) and extended to large companies in 2002. The aim of the initiative is to reduce the real cost of a companies' investment in R&D by allowing enterprises to claim tax relief for every £1 spent on qualifying R&D, allowing claims of up to 150% for SMEs and up to 125% for large companies.

17. Whilst this would appear to offer an incentive for industry to engage in R&D activities and permits outsourcing and/or collaborations with university based research, the criteria for qualifying R&D reflect the *Frascati Manual* definitions of R&D as outlined above. These criteria are set out in the *Guidelines for the*

⁸ Frascati Manual, 250, p 79

⁹ Frascati Manual, 147, p48

¹⁰ Supporting Growth in Innovation, HM Treasury, DTI, HM Revenue and Customs, July 2005

*Meaning of R&D for Tax Purposes*¹¹ and were last updated in March 2004. The guidelines state that:

“R&D for tax purposes takes place when a project seeks to achieve an advance in science or technology.”

The guidelines then go on to define science as:

“..the systematic study of the nature and behaviour of the physical and material universe. Work in the arts, humanities and social sciences, including economics, is not science for the purposes of these guidelines.”¹²

18. Apparently, despite living in a knowledge driven economy we are intent on competing on only a fraction of the available knowledge base and it is assumed that private sector innovation is driven only by natural science and technology. Paradoxically the Arts and Humanities Research Council (AHRC) and the Economic and Social Sciences Research Council (ESRC) are in receipt of monies for KT and charged with a remit to enable these activities, including KT with the private sector, whilst HEIF funding includes support for projects aiming to engage with the CIs. The messages and incentives for academia and for business would appear to be at cross-purposes here.

19. In addition to the difficulties, acknowledged in the *Frascati Manual*, that this presents for the CI sector which encompass interdisciplinary sources of research activities, the guidelines also preclude activities by definition of functionality that are central to the core business of the majority of CIs. Of particular concern is the definition of design, cosmetic and aesthetic effects and content delivered through science and technology. For these activities to qualify under the existing guidelines they must be driven by R&D that seeks to achieve scientific or technological advances or resolve scientific or technological uncertainty. In the case of content delivered through science and technology, for example the guidelines state that:

*“Information or other content which is delivered through a scientific or technological medium is not of itself science or technology. However, improvements in scientific or technological advances, and resolving the scientific or technological uncertainty associated with such projects would therefore be R&D.”*¹³

20. In a time when Europe is seeking to stimulate the production of innovative content for broadband to drive the take up of the technology and is grappling with the changes in business models brought about by digital distribution, this definition fails to reflect the necessary interplay between technology and creative content production to achieve this objective. The guidelines also state that R&D activities in design only qualify as R&D if they are part of a project whose primary focus is to contribute to the resolution of a scientific or technological uncertainty. The difficulty this presents for some enterprises within the CI sector is noted in a recent Confederation of British Industry (CBI) report, *The R&D Tax Credit, Performance and Value*, which comments that:

¹¹ Guidelines on the Meaning of R&D for Tax Purposes, <http://www.hmrc.gov.uk/manuals/cirdmanual/CIRD81300.htm>

¹² Guidelines for the Meaning of R&D for Tax Purposes, p1 and p3.

¹³ Guidelines for the Meaning of R&D for Tax Purposes, p8

*"The importance of design as an element of research and development (in particular development) is also highlighted. This is likely to be a key issue for companies in the creative industries sector considering using the tax credit."*¹⁴

21. Whilst the current consultation on R&D Tax Credits explicitly states that the government are not seeking to broaden the existing criterion for the R&D Tax Credit, the issues in claiming the support for the CIs continue to present real obstacles with claimants having to navigate the artificial separation of technology and non-technological elements of R&D activities leaving them, at best, in a position of uncertainty as to whether any R&D work they undertake will qualify and if so to what extent. Although all countries that have adopted the R&D Tax credit continue to exclude the arts and humanities from their definition of science, due to the reasons outlined above, there is evidence that a broadening of the criterion of the qualifying functionality definitions, such as has occurred in Canada, has enabled some CI sectors to claim a far greater percentage of their R&D activities under the scheme, thus incentivising an increased investment in research-based activity.

What is R&D in a Creative Economy?

22. R&D Tax Credits are just one element of a raft of innovation support products but provide a useful canvas where the impact of the embedded OECD definitions of R&D and innovation are visibly played out in practical application. The implications, however, have a far broader reach for both the CIs, arts practitioners and arts and humanities academic researchers aiming to engage in research based KT activities. There has been, and continues to be, considerable thought and debate devoted to defining and articulating practice-led research within academia but in the context of KT such a debate must also be inclusive of an identification of activities that represent the full scope of R&D and innovation with the private sector.

23. The notions of R&D and innovation indicated above are deeply ingrained in our personal and national psyches and it is therefore challenging to think of activities beyond the existing definitions in terms of R&D and innovation. Equally however it would seem unlikely to claim that the growth of the CI sector has occurred in the absence of the procurement and application of new knowledge beyond the adoption and advance of technology in isolation. At the Edinburgh Interactive Entertainment Festival (EIEF) in August of this year it was notable that both contributors and delegates in discussing future trends in the games sector, focused less on the advances in technology and more on the challenges of creating content that was engaging in terms of emotion, character and narrative. If these are the future industry indicators in term of what knowledge is required then how does an exclusion of certain areas of research from the current definition of permissible R&D in the private sector serve this identified R&D need?

24. In considering the question in the context of performing arts, researchers at a recent seminar organised by the HEIF funded Knowledge Exchange, *Westfocus* as part of a Performing Arts Network initiative, discussed their research interests which, for example, included an exploration of the relationship of the human body to technology. The potential relevance of this area of research to both CI sectors and other areas such as the Health sector is evident but as the R&D takes place through the production of a performance it neither fits into the definition of science nor the functional classification of R&D despite the existing collaborative partnerships with the industry championed by academic practitioners. R&D in this particular field presents particular challenges to the existing definitions in that the work can comprise of experimental development, often in collaboration

¹⁴ The R&D Tax Credit, Performance and Value, CBI, July 2005, p7

with industry, that is not just near market but literally in the market in that the audience of the performance are part of the R&D within the context of an engagement with a transitory output. In addition, the current classification of R&D and innovation may have a negative impact on the capacity for recognition of KT opportunities and incentives in the academic sector by its exclusive nature. It was notable that at the above seminar three out of the four academics on the panel have their own theatre or dance production companies which have arisen, or have been “spun out”, from their academic research yet this was not situated as relevant during the discussion on R&D and KT for the sector.

25. The lack of understanding of what might constitute R&D in the CI sectors and where innovation comes from is perhaps best illustrated by the *Frascati Manual* itself when providing guidance as to what does and what does not qualify as innovation in the fashion industry, stating:

“For these firms introduction of the latest colours and cut is a key element of their competitiveness. But colour and cut do not change the essential characteristics or performance of clothing i.e. that it should keep the body at an appropriate temperature be comfortable to wear and easy to maintain. Technologically improved products here almost always involve the use of new materials diffused by the textile industry and, before that, the chemical industry. For example, the introduction of drip-dry shirts, or “breathable” waterproof mountain gear, is a technological product innovation.”¹⁵

To assert that innovation in the designer fashion industry has been built upon, and is driven exclusively by, the invention of materials that deliver products such as a comfortable drip-dry shirt serves to highlight the increasing gulf of understanding between the classification of R&D and innovation, absorbed into innovation support frameworks, and the reality of the types of knowledge utilised in a creative economy. The relevance of research that draws on, for example, history of art, design and architecture in combination with advances in intelligent materials in the fashion industry disappears within this classification system.

It’s Immaterial versus It’s Not Materials

26. There is a danger in entering into this debate of becoming caught in a circular trap of being situated outside of an existing definition of R&D and innovation and therefore being unable to demonstrate activities as being R&D and innovation because they do not fit the available criteria of definition or measurement. There is an understandable tendency within this context for stakeholders to embrace rather than challenge that external positioning and perhaps argue that the terms become meaningless in relation to their activities; after all whilst the research-business interface may be invisible by classification that does not mean it does not exist and is not benefiting both universities, practitioners and society in a full range of impacts.

27. There are also a number of sound economic reasons why a broadening or updating of the existing definitions of R&D and innovation matter to government, business and researchers. The *Lambert Review*¹⁶ advocated the necessity of increasing business pull on the UK research base and the UK government has pledged to raise R&D levels in the economy from the current level of 1.9% to 2.5% of Gross Domestic Product (GDP) by 2014, with a particular focus on increasing industry spend on R&D. The inability to recognise a broad and diverse range of R&D and innovation suggests an example of where barriers to achieving

¹⁵ Oslo Manual, 174, p39

¹⁶ The Lambert Review of Business-University Collaboration, Final report, HMT, 2003

this target might exist in relation to industry sectors that are central to the knowledge economy.

28. The mismatch between investment in the public sector for KT activities and the financial disincentives for business to engage with the entire knowledge base, evident in the classification of arts and humanities research as not part of the science base in the R&D Tax Credit scheme, represents a conflict in policies and practice that should be harmonised in order to maximise the benefits of public investment. To persist in excluding areas of private sector R&D activity because it's sole purpose is not seen to be technological innovation and because the outputs are regarded as intangible is questionable if we are also to accept that a knowledge economy is not based on the manufacture of physical capital. In addition, it assumes that the risk absorption of R&D, expected and provided for in other industrial sectors, is to be absorbed by the market in the case of the CI sector.

Incentives, Innovation and Risk

29. The absence of tangible and fungible products in the CI sectors gives rise to perceived problems regarding the protection of and incentives for innovation through mechanisms of intellectual property (IP). The issue of ownership of ideas underpins any consideration of innovation in that it has previously been assumed to offer an incentive for the generation and exchange of new ideas within and across value chains and between the academy, business, the public sector, society and individuals.

30. This assumed relationship between innovation and IP would appear to be under considerable strain, if not at breaking point, in a digital and creative economy where value cannot be readily assessed and protected in terms of patents and where the perceived function of copyright is challenged through digital distribution. The CIs have understandably taken centre stage in this debate which has tended to be polarised into those advocating freedom of use of ideas and those entrenched solely in finding a way to reverse a cultural and economic shift that has already occurred under the auspices of anti-piracy.

31. In an era of what could be described as a natural occurrence of "*Creative Destruction*"¹⁷ - a market response to the monopolisation of intellectual capital which promotes an internal breakdown of existing business models and so restores a balance of power in ownership; creativity has increasingly been conflated with innovation and depicted as a key driver of the knowledge economy with little consideration given to the market pre-conditions that either stifle or stimulate it within the CIs themselves. Again the question of where and how risk is enabled and supported in these industries is a central one; particularly for those industries where R&D takes place in the market, increasingly in interactions with the user, and where failure is not permissible and risk is not easily financially enabled or absorbed without potentially damaging the enterprise or individual practitioner concerned.

32. The real relevance in this IP debate for KT activities probably lies in the middle ground and rests upon a need for choice and balance between acknowledgement, in financial revenues or by other means, for those that generate ideas and a provision for the sharing of ideas that can both stimulate further new knowledge and be an essential part of a CI business model as referenced with regard to recent changes in broadcast television sector in *Paper AHRC/TG/05/01, Business Models and Value Chains in the CIs*. It also requires a

¹⁷ The Process of Creative Destruction, Chapter V11, Capitalism, Socialism and Democracy, Joseph Schumpeter, 1942

reconsideration of the relationship between the ownership of ideas and innovation that builds upon an accurate understanding of how copyright operates in the CIs and acknowledges the role of other rights such as rights of attribution and the reputations that are built upon these. The assumption that value is always, and has always been, generated in the CI sector by the retention of rights and by copyright alone is arguable and provides an incomplete picture of how value is generated, exchanged, multiplied or depleted across value chains.

33. Any consideration of IP reform within a creative economy demands a proper recognition of the nature of the outputs and assets of CIs and it may be helpful to consider this within the concepts of rivalrous and non-rivalrous property.¹⁸ With the former, when someone takes or buys part of what you own you then have less as a result whereas with the latter, the taking or buying does not reduce or diminish the stock of what you own – indeed in some cases the transaction may increase the value what you own. In terms of KT, this may provide a useful context to considerations of the negotiation and management of issues of ownership.

34. The crisis of IP is not the preserve of the private sector in a knowledge economy. It is an equally pressing issue for universities and researchers engaging in KT. Any insistence on central retention of the rights of individual researchers by HEIs has been met with strong resistance and it is of particular concern to the many academic practitioners and part-time industry based staff that form a vital knowledge bridge between the academy and the private sector. In addition, an approach to collaboration through the central KT offices in HEIs that is based on an immediate, predetermined negotiation of IP retention, particularly with the advent of Full Economic Costing, is unlikely to enable research based collaborations with the CI sector. The evidence on KT brokerage models for the sector to date suggests that successful and sustainable connectivity occurs when the third party does not seek to retain any of the IP, as in the case of the *Watershed Media Centre* and *3CResearch*, for example. These models would seem to suggest that the highest divisibility of IP possible in collaborative partnerships, particularly when the partnerships involve organisations across a range of scale, derives the maximum added value for all parties. This is worth considering in the light of the R&D Tax Credit guidelines which stipulate that SMEs must retain all IP derived from their R&D activities to qualify for this form of state aid.

Unweaving the Rainbow

35. This paper aims to outline, at a macro level, two inter-related mechanisms by which R&D and innovation are defined and underpinned; by a classification system that provides a narrow and seemingly inappropriate definition for both concepts in a knowledge economy and by intellectual property laws that arose out of a belief that the protection of original ideas would provide an instrument that would offer an incentive and reward for innovation by individuals. Neither system would appear to be adequate in their existing form or implementation in a creative economy that is dependent on collaboration, sharing of knowledge and new forms and processes of R&D with industries that combine elements from the full range of academic disciplines.

36. To see beyond any highly embedded and diffuse structures is invariably challenging; that is, after all, a key characteristic of innovation. Any sustainable engagement in competing in a knowledge economy, however, cannot afford to risk ignoring the fact that sectors such as the CIs, that are central to driving such

¹⁸ Terms adopted from a speech by Professor John Naughton, Westminster Media Forum, Intellectual Property and Rights Ownership, January 2005

an economy, are dependent on both technology and other sources of knowledge and research for their continued growth and may engage in forms of R&D and innovation processes that are outside of the definitions currently employed.

37. Whilst IP rights would appear to have been granted in Europe without the existence of any evidence base that suggests there is a causal link between strengthened rights and innovation, as in the case of the European database directive¹⁹, any broadening of the classification and understanding of R&D in a knowledge economy will require a demonstration of potential, of what constitutes R&D in the CIs, where innovation is derived from and how this is linked, or not, to existing IP structures through case studies rather than statistics. In searching for an existing evidence base in this area it is notable that only one country to date, New Zealand, has attempted to engage directly with these issues in a discussion paper, *R&D Strategy for the Creative Industries*²⁰. This discussion document begins to consult CI practitioners as to what constitutes R&D in their sector. Very few of the answers collated in the paper would qualify as R&D under the *Frascati Manual* definitions.

38. The poet John Keats and the mathematician and physicist Sir Issac Newton had differing views of how new knowledge is acquired and utilised. Keats criticised Newton's prismatic colour analysis of a rainbow for its dismantling of an organic whole describing it in his poem *Lamia* as "*unweaving a rainbow*"; whilst Newton described the accumulative process of knowledge as "*standing on the shoulders of giants to see further*". It is an irony of history that neither Keats nor Newton would have fared well under the current R&D Tax Credit guidelines – mathematics as well as arts and humanities being excluded from the current definition of science.

39. In the 21st century the creative industries stand on the shoulders of both Keats and Newton and their successors across all disciplines of knowledge. We can, and do, no longer live in a world of two cultures where art and science are artificially polarised by outmoded frameworks of classification. This was clearly articulated in the report *Imagination and Understanding*²¹ in 2001 which stated that:

"In the circumstances of modern society and a modern global economy, the concept of a distinct frontier between science and the arts and humanities is anachronistic. Successful economies depend increasingly on the creation, communication, understanding and use of ideas and images."

If the UK and Europe are serious about ensuring both the future growth of these industries and of the economy for the benefit of wider society by 2010 then there is an intangible but visible rainbow that requires unweaving with the purpose of constructing a more inclusive representation of a whole that accurately reflects tomorrow's creative economy.

Julie Taylor, September 2005.

¹⁹ Deconstructing Stupidity, James Boyle, Financial Times, April 21, 2005

²⁰ R&D Strategy for the Creative Industries, Foundation for Research, Science and Technology, New Zealand, August 2003.

²¹ Imagination and Understanding, A Report on the Arts and Humanities in relation to Science and Technology, Council for Science and Technology, July 2001

Annex A

**Table 3.1. International Standard Industrial Classification arranged for the purposes of R&D statistics
ISIC Rev. 3.1**

Division/Group/Class

AGRICULTURE, HUNTING, FORESTRY AND FISHING 01, 02, 05

MINING AND QUARRYING 10, 11, 12, 13, 14

MANUFACTURING 15-37

Food, beverages and tobacco 15 + 16

Food products and beverages 15

Tobacco products 16

Textiles, fur and leather 17 + 18 + 19

Textiles 17

Wearing apparel and fur 18

Leather products and footwear 19

Wood, paper, printing, publishing 20 + 21 + 22

Wood and cork (not furniture) 20

Paper and paper products 21

Publishing, printing and reproduction of recorded media 22

Coke, petroleum, nuclear fuel, chemicals and products, rubber

And plastics 23 + 24 + 25

Coke, refined petroleum products and nuclear fuel 23

Coke and nuclear fuel 23 (less 232)

Refined petroleum products 232

Chemicals and chemical products 24

Chemicals and chemical products (less pharmaceuticals) 24 (less 2423)

Pharmaceuticals 2423

Rubber and plastics products 25

Non-metallic mineral products 26

Basic metals 27

Basic metals iron and steel 271 and 2731

Basic metals, non ferrous 272 + 2732

Fabricated metal products, machinery and equipment, instruments and transport 28-35

Fabricated metal products, except machinery and equipment 28

Machinery and equipment, n.e.c. 29

Engines and turbines, except aircraft, vehicle and cycle 2911

Special purpose machinery 292

Machine-tools 2922

Weapons and ammunition 2927

Office, accounting and computing machinery 30

Electrical machinery and apparatus n.e.c. 31

Electrical motors, generators and transformers 311

Electricity distribution and control apparatus (includes semiconductors) 312

Insulated wire and cable (includes fibre optic cable) 313

Accumulators, primary cells and primary batteries 314

Electric lamps and lighting equipment 315

Other electrical equipment n.e.c. 316

Radio, television and communication equipment and apparatus 32

Electronic valves, tubes and components 321

TV, radio transmitters and line apparatus 322

TV and radio receivers, sound and video goods 323

Medical, precision and optical instruments, watches and clocks (Instruments) 33

Medical appliances, instruments and control equipment 331
 Instruments and appliances for measuring, checking, testing,
 Navigating and other purposes, except industrial process control
 Equipment 332
 Industrial process control equipment 333
 Optical instruments and photographic equipment 334
 Watches and clocks 335
 Motor vehicles, trailers and semi-trailers 34
 Other transport equipment 35
 Ships and boats 351
 Railway and tramway locomotives and rolling stock 352
 Aircraft and spacecraft 353
 Transport equipment, n.e.c. 354 + 355
 Furniture; other manufacturing, n.e.c. 36
 Furniture 361
 Other manufacturing, n.e.c 362-365
 Recycling 37
ELECTRICITY, GAS AND WATER SUPPLY 40, 41
CONSTRUCTION 45
SERVICES SECTOR 50-99
 Wholesale, retail trade and motor vehicle repair 50, 51, 52
 Wholesale of computers, computer peripheral equipment
 and software 5151
 Wholesale of electronic parts and equipment 5152
 Hotels and restaurants 55
 Transport, storage and communications 60, 61, 62, 63, 64
 Telecommunications 642
 Other 60-64 less 642
 Financial intermediation includes insurance 65, 66, 67
 Real estate, renting and business activities 70, 71, 72, 73, 74
 Renting of office machinery and equipment (including computers) 7123
 Computer and related activities 72
 Software consultancy and supply 722
 Research and development 73
 Other business activities 74
 Architectural, engineering and other technical activities 742
 Community, social and personal service activities, etc. 75-99

 GRAND TOTAL 01-99
 Source: OECD.

Sources

- 1) Capitalism, Socialism and Democracy, Joseph Schumpeter, 1942
- 2) Commercialisation of research activities in the humanities, arts and social sciences in Australia, Council for the Arts & Social Sciences, Australia, May 2005
- 3) Creativity is Not Enough, Global Best practice in Digital Game Publishing, DTI and IC CAVE, 2003
- 4) Deconstructing Stupidity, James Boyle, Financial Times, April 21, 2005
- 5) Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development, OECD, 2002 (sixth edition).
- 6) Guidelines on the Meaning of R&D for Tax Purposes, HMT, DTI, HM Revenue & Customs
- 7) Imagination and Understanding, A Report on Arts and Humanities in relation to Science and Technology, Council for Science and Technology, July 2001
- 8) Intellectual Property and Rights Ownership Westminster Media Forum, January 2005
- 9) Operationalizing Definitions of Innovation at the Level of the Firm, Centre for Policy Research on Science and Technology, Simon Fraser University, Canada, 2001
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