The Mass Innovation Era

About twenty years ago a new kind of bike started appearing on British streets: the mountain bike. Where did it come from? Not from a lone inventor working in his shed experimenting feverishly. Not from the research and development lab of a mainstream bike manufacturer. The mountain bike came from users, especially a group of young biking enthusiasts in northern California who were frustrated that they could not ride along mountain trails on racing bikes. The pulled together clunky frames from traditional town bikes, gears from racing bikes, balloon tires and brakes from motor cycles. For the first few years these bikes made in garages were known as "clunkers." A tiny cottage industry emerged and by 1976 in Marin County, just north of San Francisco there were a half-dozen small assemblers run by enthusiasts making bikes for their mates. The first commercial mountain bike came out in 1982 and then the big bike manufacturers piled in. By the mid 1980s, fifteen years after the users had developed the first mountain bike, it was a staple of the mainstream market. In the year 2000, mountain bikes accounted for 65% of bike sales in the US, about $58bn. An entire product category and the lifestyle to go with it was invented not by bike manufacturers and their designers, but by the users.

And it's not just biking. In the last five years kitesurfing – standing on a surfboard while being pulled along by a kite - has become a global sport worth in excess of $100m: again it was all started by the users. High performance windsurfing is a $1bn dollar business that was started by users. In the last few years amateur astronomers have innovated cheap digital telescopes which now allow them to see starts that only Jodrell Bank could identify thirty years ago. In 1995 there were about 122 people trading on the forerunner to eBay. Now there are 122m. eBay's growth is in large part due to putting easy to use tools in the hands of users – like eBay's rating system - and letting them get on with trading together. EBay charges for providing a platform and the tools. Users are free to do pretty much as they like with them. eBay the company is sustained by the communities of eBay users who provide much of the innovation. The same spirit is at work in politics. As formal top down politics has become more professionalized and managerial, so grass roots political campaigns made by Pro-Am activists – Jubilee 2000 is the best example – have sprung up.

The biggest competitor to Microsoft's dominance of the market for computer operating systems comes from Linux, a programme developed by an open source collaborative of perhaps 140,000 computer users, with a core of perhaps 2,000 programmers, who have contributed their time, ideas and effort for free. The best hope of breaking Microsoft's monopoly rests with an alliance of users who have the tools, knowledge and passion to make an alternative.

What is at stake here is something fundamental to the way we see innovation, design and creativity and the way we organise our economy around them. We are moving from an era of mass production to mass innovation.

The 20th century was the era of the rise of mass production: marshalling people, materials and machines to mass manufacture physical products in factories. The user-driven communities of innovation emerging now, open up an era of mass innovation, in which creating new products and services becomes a participative, democratic activity sustained by communities of innovation not just by companies. That changes the role of design and designers.

Design used to be done by specialists for and to users. From now on, in a growing number of fields, design will be done with users and by them, as they co-create products and services with specialists.

We will need to rethink deep seated notions of creativity and innovation. We like to think that innovation comes in a flash of genius and insight, a eureka moment, to an individual who is the author of the new idea. Our patent system is based on the idea that the individual inventor can say in advance what their invention is for. To get more innovation, design and creativity you need to put more specially gifted people in special places – cut off from the hum-drum everyday, commercial world around them – to dream up ideas which then flow down a pipeline to largely passive consumers. We have come to think that all creativity resides in the special people and places, the home of the creative

class: the designer in his studio, the boffin in the lab, the geek in the garage, the bohemians wandering the cultural quarters of our leading cities.

All that is being challenged by a user revolution. The audience is no longer prepared just to sit in rows in the stalls, politely listening to the performance on the stage. They want to become participants in the action themselves, putting on their own performances, critiquing what is going on. Growing user involvement in innovation and design – the democratisation of innovation as MIT economist Eric von Hippel calls it – promises to transform a swathe established institutions and professions.

The best example is perhaps computer games, which outsold Hollywood films this year. One estimate is that 90% of the content of the most successful games, like the Sims, is now created by users making their own modifications to the game. One user-developed tool for the Sims allows a player to etch in a border on a rug on the floor of a room in the game. More than 400,000 people have downloaded this tool. The basic software platform for the Sims is made by Electronic Arts. But it has also provided users with tools and access to its code to allow them to fiddle around with the game. Scores of independent websites make these modifications available. Users are constantly added new features to the game, extending its life. The Sims is the product of joint authorship, developed over several years of cumulative innovation, between the games designers and its leading users.

Hilary Cottam won the Design Museum's designer of the year award ten days ago because she understands this shift. Cottam does not design for people but with them. Her aim is not deliver her solution but to give users the tools and support they need to develop their own solutions. She has been particularly committed to applying this thinking to big public service issues in education, crime and health – areas where few designers work. Her work on these big public issues may be one reason why her entry to the competition won the public vote.

Take diabetes as an example, which costs the NHS £5m a day and is one of the main causes of premature death. The average diabetic spends just three hours a year with doctors, but thousands of hours a year self-managing their condition. The biggest gains will come from enabling diabetics to become more effective at self-diagnosis and self-management, equipping them with tools, techniques and peer support. About 90% of health care gets delivered in the home. People want more home based solutions that they feel in control of. The health information available to patients in the Internet is transforming their role: no longer passive, they can question and participate. The challenge for public services is how to enlist public service users as co-producers and co-designers in the way the computer games industry has. That is what Cottam has set out to explore.

That exploration immediately hits two big issues. The first is that the users may want – not unreasonably - some recognition for their role as joint authors of innovation. In computer games that comes in the form of recognition from within the community of gamers. The storm in a tea cup over Cottam's role in the redesign of Kingsdale school is a case in point: she has never claimed she designed the school's building, but she worked for two years with children at the school to help give them a voice in the process and develop a new account of how the school could operate. Authorship of Kingsdale's re-design as she acknowledges is shared among many people.

The second issue is the response of professionals – designers, doctors, head teachers, architects – who feel their position may be threatened by growing user participation. A good example is what is happening to journalism.

When I started out as a national newspaper journalist almost twenty years ago we allowed readers to contribute to the paper through two narrow windows. They could write a letter to the editor, which we might publish, usually cut in half. Or if they were famous and well connected they could write a piece for the comment pages. We did not allow the readers in anywhere else: their job was to sit back and read and tell us how clever we were.

These days Big J journalism finds itself surrounded by a vast army Pro Am journalists writing online web logs, known as blogs. Shock, horror: the readers, at least some of them, want to become writers and publishers and they have the tools to do it. They want to have a voice. The audience is taking to the stage. The response of some journalists – mirrored in other professions – is to recoil defensively: the blogs cannot be trusted, it's not real journalism, they have no real credentials. A more productive way to see the rise of blogs is to that the domain of comment and news has expanded enormously. Big J journalism still has a critical role but within a vastly expanded arena in which more people can have a voice. The most innovative news organisations will find ways to work with this vast distributed army of newshounds and commentators, not shun them. They will need to.

CBS television has no more than a handful of foreign correspondents, many of them US-based, who fly out when a story breaks. So when the tsunami hit all across the Indian Ocean they were rather stretched. Go on the web and you can find 74,000 separate pieces of user generated video footage of the tsunami and its aftermath.

To its credit the BBC is fast catching up with these trends by making its creative archive openly available and through its iCan tools which allow people to become contributors not just passive viewers of television. The BBC's emerging model, providing users with tools and platforms on which they can share ideas, as well as traditional television services, is one that other public services will have to follow.

Hilary Cottam does not design buildings, kettles, sofas or typefaces. She designs tools, platforms and processes that mobilise the mass, distributed intelligence of users. It is an approach which could transform the way we think about public and private services. User innovation will only become more powerful.

Technology for design, prototyping and experimentation that was once the preserve of professionals is now getting cheaper and easier to use. Thanks to the Internet groups of

users can easily get together to share their ideas. User led innovation speaks to the democratic and creative ethos of the times. People want to have a voice, at least some of the time.

Put it this way. If only one per cent the 1m players of a computer game generate new ideas the game has a developer workforce of 10,000 people. What would it take for us to re design education policy so that one per cent of the millions of children in British schools saw themselves as co-developers of learning, doing for education what many willingly do for computer games?

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Nesta Strategy

Where is innovation?

Imagine that promoting innovation is a bit like staging a performance. The performer takes to the stage, the audience sits in rows, watching and listening. It is clear where the new ideas are coming from: the stage. The audience looks forward. Nesta's role in this world would be to get more talent on the stage, in particular talent that the market might not initially support. To help this new talent Nesta might provide microphones, lighting, special effects and visuals to amplify the impact the performance has.

But what if innovation emerges in a slightly different way? What if the performer leaves the stage and starts to wander towards the back of the auditorium? It becomes increasingly difficult for the audience at the front of the room to hear and follow what is being said. They have to crane their necks. The auditorium is set up for ideas to come from the stage: that is where everyone is organised to look. But now they are coming from the back of the room. Indeed, it's not even that simple. Ideas start coming from several places at the back of the room at the same time. New performers keep popping up, establishing their own makeshift stages. People need swivel chairs to keep track. They get dizzy whirling round. No one pair of eyes can spot where all the best ideas are coming from. Now members of the audience have started to get up and participate themselves. Some might want to take to a stage in an attempt to become performers. Others have started to stage their own impromptu performances around the auditorium. Mini stages are starting to appear all over the place. Groups have formed where people discuss particular aspects of the performance they are interested in: they have become critics. New ideas worth listening to are not just coming from the stage. They are coming from all over. There is far more going on in the auditorium than on the stage, but it is difficult to make sense of all the activity. Conversations have multiplied but they have become more fragmented.

This is not a picture of the future, it is already happening in many areas of culture. Take journalism as an example. Twenty years ago readers might have contributed to a newspaper by writing a letter to the editor. If they knew the editor, they might get a piece placed on the op-ed pages. Those were the only places that journalists allowed

readers into their world. The journalists reported; the publishers published and the readers read. Now it turns out many of the readers also want to be writers and mini-publishers, communicating their work to mainly very small audiences through online personal commentaries called blogs. Only a small minority of bloggers want to become Big J journalists. Most just want their own distinctive voice. The domain of journalism and possible comment on the world has expanded enormously. Alongside the narrow world of Big J journalism a much larger little j journalism has grown up. The same has happened in popular music in part through the spread of cheap recording technology and music software. More people are taking part than ever before. The domain of creativity has expanded.

In the first world it was clear where ideas were coming from: the man on the stage with the microphone. To promote more innovation you needed to get more people on the stage. That was how Nesta was conceived, to find and promote talent – hidden gems - that were overlooked by the traditional funding system. The goal was to get more people into an otherwise closed world.

In the second world there is far more going on. Many more people are taking part, devising their own contributions, being creative. Creativity is not confined to the people on the stage. This world may appear less structured and it can be cacophonous but it's also potentially richer and more diverse. The goal is to expand the whole domain so that many more people can take part in small and large ways.

The argument of this paper is that the way innovation and creativity emerges is moving from the first to the second world. There are two key parts to that story.

First, the scope for creativity is expanding. Creativity and innovation will become increasingly distributed, emerging from many, often unusual sources. It will come from the audience as well as the stage. Nesta's main task should be to enable this expansion of creativity, towards innovation as a more democratic, less technocratic and specialised activity.

Second, creativity will is increasingly come not from mythic, talented, lone individuals – inventors, mavericks, eccentrics – but from creative collaborations, that

bring together different ideas and players. That means we should not be looking for lone individuals but to communities of creativity that will organise themselves around an emerging market or opportunity.

Context

Nesta has been an intriguing, maverick, but fringe player in the larger debates in the UK about the role of creativity and innovation. If Nesta believes its own analysis of the importance of creativity and innovation in the future of Britain's competitiveness, wealth and quality of life, then it should be far more ambitious. It's role should be more like that of Sitra in Finland which is charged with thinking about and looking after Finland's future. It needs to become more serious and strategic about its interventions.

When Nesta started it was mainly a response to past failings, a history of missed opportunity in emerging industries: a world in which too many innovators found it too difficult to get funding to commercialise their inventions. The contrast with the culture of technical entrepreneurship in the US was particularly striking. That is still a shortcoming that needs fixing. But the strategic context is even more challenging.

In the final quarter of the 20th century production was increasingly distributed around the globe through with trade, investment and financial flows. The new Asian economies rose on that wave.

Yet while production was distributed along extended supply chains, innovation, creativity and R & D remained centralised in traditional locations in rich countries, and for good reason. It takes a long time to build up a knowledge base. A strong knowledge base tends to attract more knowledge to it. Those already rich in knowledge often find it easier to absorb new knowledge as it emerges. Innovation involves a great deal of uncertainty. Resolving those uncertainties involves a great deal of face-to-face interaction, which in turn requires proximity. You cannot outsource creativity in the way you can outsource a plastic moulded component. You cannot schedule to have a new idea, just-in-time, at 3pm on Thursday. So while production moved around the world, innovation stayed at home. In the 1980s only about 6% of US R&D was conducted abroad, roughly the same proportion as in the

1930s. Only 1% of Japanese R&D is done outside Japan. US and Europe tended to dominate cultural and creative industries.

That picture is changing rapidly. China is already the world's third largest R & D investor (after Japan and the US) with Chinese investment in R & D is rising by 23% a year. US corporate investment in Chinese R & D is worth about $500m a year. Within this decade Chinese R & D may be worth 2% of GDP. China is producing 400,000 engineers a year. India meanwhile is producing 2m college graduates a year. Indian scientists cost a tenth of their counterparts here. Investment in innovation is rising elsewhere. As China and India claim a larger share of basic industries so other countries around Asia feel their competitiveness threatened and so invest more in R & D: Korea, Taiwan, Singapore, Philippines. Elsewhere Brazil, Russia, Israel and Mexico have well elaborated innovation strategies. In all these places more attention is being paid to creative, cultural and media industries as well as science and technology. There is no room for complacency.

Ten years ago it may have sounded fanciful to argue that creativity was the key to Britain's long term prosperity. Creativity was seen as an attractive add on: young, trendy, something people talked about in the bars and cafes of self-styled cultural quarters but not on housing estates or in pubs. In ten years time it will be a savage reality that creativity will be vital to our future. Nesta's main role must be to drive that message home and to help turn Britain into a genuinely creative society. Not just a place where a few chosen, talent individuals can flourish, but where creativity is a broadly spread capacity in society. To that do that Nesta needs a clearer story about the way creativity and innovation emerges and the role it can play in promoting that.

The View Down the Pipeline
We work with ideas of creativity and innovation largely inherited from the industrial era. A dominant image of creativity is the artist, often working alone, at odds with, separated from the industrial system of work and production. This still feed romantic ideas of creativity as an individualistic, intuitive activity of self-expression, to find an inner voice. Creativity is a natural gift bestowed on a few people. In some ways Richard Florida's *Creative Class* is in this tradition: the creative class is larger than it was but it is made up of special people, doing special jobs, in special conditions.

A second image is the boffin: the lone inventor or scientist, working in their lab, obsessive and socially ill at ease. That fuses with the entrepreneur-inventor – the hero figure of American capitalism – who not only comes up with an idea but then creates a company around it. The iconic figure in this tradition is Edison who paved the way not just for the rise of corporate R & D but also for generations of techno-entrepreneurs who started businesses with garage based R & D.

Common assumptions underpin these accounts of creativity and innovation. Creativity comes from special people, working in special conditions, usually cut off from the market either by patronage or by penury. Talented individuals are at the heart of creativity. Inventors are creative when they have a eureka moment. An invention has a moment of birth. The inventor – identified in the patent – can say in advance what the invention is for. Inventors invent a discrete thing – a product of service, the light bulb or the phonograph, just as artists create a distinct work of art.

The policy implications of this view of the world are clear. To get more creativity you need more special people, in more special places. Then the task is to speed up the flow of their ideas down the pipeline to the market, by lubricating the pipeline with financing and incentives, removing obstacles that hold back some innovators. The role of intellectual property is unproblematic: to protect, control and exploit the inventor's distinct intellectual capital.

It is only in the last 10-15 years that innovation has taken centre stage as <u>the</u> crucial factor in competitive advantage. We are just starting to explore what that means for our society and its institutions, most of which were designed for industrial era.

This will be a long process. Seventy years after Ford invented mass manufacturing, the company set out on its After Japan programme to save itself by learning from Toyota's techniques for lean production and just-in-time manufacturing.

Adjusting to a post-industrial economy, driven by innovation, could be an equally protracted process of adjustment that is never complete. That is how to position Nesta's consideration of its future strategy. We are just five years into a process of trial, error, adjustment and learning – the creation of an innovation society – that might take decades.

What principles should guide that process of adjustment? We need to bring to light and question assumptions that have shaped our ideas of creativity and innovation, and so the institutions designed to support these activities. Perhaps instead we need to be fashioned a sense of creativity - who is creative, where, how and why – fashioned for an innovation driven, networked, globalised economy.

That has combined with two other critical elements in the way we think of creativity and innovation.

Innovation and creativity are a feature of economic and social development, a mark of richer and more sophisticated societies. We look back at past societies and judge how civilised they were by their ingenuity. Creativity requires spare resources over and above those devoted to meeting basic needs and that means wealth. Creativity is something only rich countries can really afford to indulge in. But it is a necessity as much as a choice. As richer nations find their competitive advantage eroded in traditional industries so they have to turn to innovation to add value. Gordon's Brown's current mantra: China will make it, India will process it, Britain must create it.

We also tend to think innovation and creativity stem from cultures that encourage diversity, independent thinking, free association. Creative cultures tolerate a large number of experiments, some of which are bound to end in failure. That is acceptable because risks are highly distributed. For those reasons innovation tends to come from market societies and liberal democracies, which allow decentralisation and plurality. The state has played a critical role in innovation in all developed countries – in the 1970s and 1980s Japan's Miti was the model most envied. Now the Silicon Valley model based on links between universities, venture capitalists and entrepreneurs has become the most fashionable. Florida's account is the high point of this cultural-climate-driven account of innovation: creativity comes from the creative class, which tends to congregate in places that have a conducive climate, marked by tolerance and an acceptance of diversity.

All this provides an apparently coherent, even comforting story for developed nations such as the UK. We have a reasonably good grasp on what creativity and innovation involves. As a richer nation we should have the capacity to invest in innovation in response to rising competitive challenges. Most important we have a liberal, market culture which seems well suited to the promotion of innovation.

It's reasonably clear what role a body such as Nesta should play: make the current innovation system work more effectively, by finding the market failures and

helping to correct them, filling in the missing links in the innovation value chain. Nesta is a problem solver within a relatively well-established approach to innovation that has some glaring and long standing weaknesses. It's job is to correct those weaknesses.

But what if many of the background assumptions for this standard model turn out to be wrongor open to challenge? How might that change how Nesta should see its role? Nearly every aspect of the standard account of how and where creativity comes about should be challenged.

Innovation rarely comes from lone individuals, no matter how brilliant. Innovation is invariably the product of combining different ideas and insights. That is the product of interactions of people, ideas and viewpoints. To promote innovation we need to increase the rate of creative interaction in partnerships, networks, communities of cross-pollination. Innovation is usually the product of joint-authorship which is cumulative, collaborative and evolutionary.

Users are playing an increasingly important role in innovation as a source for disruptive innovations which start in marginal markets; innovating in use to incorporate new technologies into social practices; providing vital inputs to cultural and service innovations where users have a critical role. It is often difficult to say in advance what a technology is for until the users find out for themselves. Pro-Am users – dedicated, passionate, knowledgeable lead users are critical to innovation. As well as funding the supply side, the inventors, we should be funding innovative cultures of consumption.

Innovation is often not about discrete products and services, gizmos and gadgets. Often to be effective innovation has to shape interconnected systems of supply, demand, regulation, technologies and social pracrtices. This has always been true of innovation: Edison succeeded not because he was the first to invent the light bulb but because he attended to the complementary innovations in electricity generation and transmission to make the light bulb a commercial possibility. More recently Nokia rose to lead the mobile phone business because it saw its job as orchestrating innovation among many players around the "new value domain" of mobile telephony. It did not just innovate a stand alone product; it helped to orchestrate technology, software, infrastructure, standards, services and new forms of consumer behaviours. Innovation policy should focus on these new and emerging value domains and orchestrating a critical mass of innovators – in technologies and services, among consumers and suppliers. That is especially true for public goods such as learning, health, the environment, where we need to shift entire systems of production, consumption and regulation.

Innovation is no longer just the preserve of the rich nations, a stage of advanced economic development. Developing nations are leapfrogging into creativity and innovation. In India the strategy is human capital led with a focus on software and biotech. In China there is much greater emphasis on infrastructure. Twenty years ago it might have been possible to identify easily the main sources of research in a given field, based on historic knowledge monopolies towering over a flat plain. Now in virtually every field of science

and culture the landscape is far more varied and populated. As China sucks in manufacturing capacity so the rest of Asia – Taiwan, Korea and Singapore for example – are increasing their investment in innovation, science, technology and cultural industries. Innovation will come from many more sources.

That in turn means the Florida thesis – that tolerant, market-based liberal-democracies will be more innovative - cannot be taken for granted. Asia in its many different forms will challenge that, with science and innovations strategies that given the state a large role and encourage experimentation without many of the accompaniments of liberal rights. This may be particularly important in some aspects of biotech. Asian pragmatism about animal experiments, for example, may give these countries a lead over societies where an odd mixture of liberal and Christian fundamentalist opposition to biotech could stall it.

Nor can we take for granted the climate for creativity in liberal democracies. The US post-9/11 may be turning more conservative, less optimistic and outward looking. It may be losing the very cultural qualities that Florida highlighted as essential to its innovative success. War and security concerns are not necessarily bad for innovation: military research helped to fund the Internet. But Florida's evocation of open, tolerant optimism may turn out to have been the story of the 1990s which the current conservative climate has brought to an end.

Moreover outside the US the most innovative societies over the last decade have tended to be small, quite socially homogenous, where the state has a legitimate role in leading society and mobilising players from different sectors: Finland, Sweden, Ireland, Israel. One lesson from these places is that long term social consensus about the role of knowledge and research is vital to underpin a highly collaborative, public-private strategy, often led by highly entrepreneurial public bodies such as Sitra in Finland, the Economic Development Board in Singapore and Itri in Taiwan. The public sector can provide a vital shared platform for collaborative innovation. These societies are mainly more egalitarian than the UK and Nesta's equivalents in these societies are more strategic and entrepreneurial.

Innovation once the preserve of special people working in special conditions is becoming a much more open and distributed. New more open, distributed institutions and organisations are emerging designed to be fit for this environment: clusters, networks, open source communities, smart mobs, swarms, communities of co-creation and cross pollination. More people can be more creative about more aspects of life than ever before. New ideas are emerging more rapidly from multiplying sources. Capacity to combine those ideas is rising. This new more open world of innovation will spawn new kinds of organisations. That is where Nesta should be operating.

What might that mean for the way that Nesta conceives of its role?
Fund communities of creativity not just individuals. Fund creative interactions. Connecting with international flows of ideas and people.

Nesta funded shared platforms for creativity, as well as grants to individuals to play on the platform.

Nesta should seek to orchestrate a range of players: better at partnerships, collaboration less stand alone.

Fund innovation of systems and creation of new/emerging value domains.

Focus on major public priorities: environment, ageing, home based health care, personalised education, where need innovation.

Can see this as a natural development of Nesta's purpose. Nesta has always stood for expansion of the right to be creative. Funding people the mainstream system would not fund. Solving problems within the current system. New approach would be radicalisation of that to become more focused and ambitious. To pioneer creation of new open. democratic and distributed models of innovation, addressed at emerging value domains where big gains to public value: environment, health, learning, ageing, safety, transport.