

Barlow memorial lecture
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Being the BBC in the information age: towards a new broadcasting system

Introduction

I would like to start by thanking you for the opportunity to speak this evening. I believe we are living through an extraordinary time at the advent of a new era when society is moving from the industrial age to the information age. I also believe that people are better able to govern themselves the more information they have access to. Tonight I am going to talk to you about how the BBC will evolve in this new era and about how a new broadcasting system will become part of this story.

Me and BBC R&D

I am someone who has always been interested in the interplay between society and technology, the way that each effects the development of the other and the role that this interaction plays in moving the human story forward. As such it is a pleasure to address this audience in this place and a real honour to deliver a lecture in memory of Professor Barlow. Technology innovations from Professor Barlow and many other UCL alumni like Bell, Flemming and Kao have had a profound effect on the way we live our lives and demonstrate how engineering creates the foundations of progress.

Given my passion for this relationship you can understand that it is an immense privilege to be speaking to you as the Controller of BBC R&D. BBC R&D are a group of scientists, engineers, designers and support staff who, given the nature of their work, have always been right at the heart of this interaction between technology and society. The potential of broadcasting was recognised very early on in the development of the related technologies leading to the formation of the British Broadcasting Company and then, the British Broadcasting Corporation. It is no accident that after the appointment of the Editor in Chief Lord Reith the

second employee was the Chief engineer and the third was a research engineer. Since then the group has been involved with most of the key technology innovations in broadcasting from the development of FM to digital switch over today. For someone like me, to be involved with a group making this kind of contribution to the interplay between technology and society is very rewarding and great fun.

The question

We know that our technical work underpins the BBC's pursuit of its mission and that is essentially a social impact. The information age will affect the technology we are working with and the kind of social outcomes we are trying to achieve. To that end my lecture is based on two contentions the first broadly social and the second more technical:

The first is that the role of broadcasters becomes more important as society moves from the industrial age to the information age but that this role must be reinterpreted to reflect the new context.

My second contention is that to deliver our mission in a way that is fit for the information age we will have to build a new broadcasting system.

And so I will start with 'Being the BBC in the information age'

What the BBC has been

To really understand the transition that the BBC is making it is perhaps useful to start by reminding ourselves what the BBC was in the industrial age. This is a topic that it would be possible to devote at least a whole evening to but in many ways a phrase coined by Lord Reith has endured to describe the essence of what can be a very complex institution; he said that the BBC existed to **inform, educate and entertain**. It is a mission that served the organisation well over the last century as we moved from radio into television, from a single service to a portfolio of national and local networks and eventually onto the worldwide web.

I have always felt that the key to understanding the mission is to understand it as '**agreed provision**'. By that I mean that the BBC is a conscious act by society to ensure that its members have access to a guaranteed level of information, education and entertainment in the belief that such an act will improve our society. In that sense it is similar to ideas such as the National Health Service or the Legal Aid system; all institutions that describe minimum levels of provision that we collectively feel ensure a fairer and better functioning society.

We can see this sense of 'agreed provision' in how Reith's original mission has been translated over the years into the BBC's charter. Most recently it is reflected in the six public purposes that the government calls on the BBC to deliver. For example one of the purposes is to 'Sustain citizenship and civil society' by providing an agreed level of high quality, trustworthy and impartial information.

Characteristics of broadcasting

Inform, educate and entertain describes what the BBC set out to achieve in the industrial age but this mission only tells us half of what the BBC was. The other half relates to what it meant to be a broadcaster. These are characteristics that are now obvious and taken for granted but when Reith set out with those early engineers and editorial staff they were only understood as potential. It was the potential of broadcasting technologies and therefore broadcasters that was recognised as having great power and so led to the creation of the BBC.

Universality and guaranteed access

The first of these important characteristics was **universality** or the recognition that broadcast technologies could reach everyone in the country. This defined the BBC as an organisation that should seek to offer something for everybody, an organisation that had both the power and the responsibility to appeal across society. It also offered the promise of **guaranteed access**, that the service would be there, waiting for anyone with a receiver. The technologies secured the prospect of that minimum level of information, education and entertainment for everyone in society.

Live / Linear

The second characteristic that defined broadcasting was the sense of **'live'** or **'linear'**. This meant that the service would be a persistent presence, that it would have immediacy and would always be current. Sometimes this was quite a gentle characteristic where a set of programming would reflect the mood of society in a general sense, exploring topics that had relevance, sometimes even defining the zeitgeist in some small way. At other times this characteristic was more acute; for example during moments of crisis where the ability to be absolutely up to date coupled with universality quickly defined broadcasting as the medium people turned to in an emergency.

Quality

The final characteristic I think is important to this discussion but is not necessarily intrinsic to the BBC's mission or the technologies of broadcasting is one that I would argue has always been an ambition of the BBC, and often one it has achieved. The BBC has always sought to offer a service of high **quality**. This is especially important for two reasons.

It relates to concept of minimum provision I outlined earlier. In the early days of broadcasting the BBC was the UK's only broadcaster and this created a responsibility to deliver a high quality service that the organisation embraced and which became part of its DNA. Later other broadcasters emerged but the BBC continued to strive for quality and that helped to set the bar for what people should expect.

The second reason that quality is important in defining the BBC is that it is a characteristic that relates to both sides of the organisation, its engineers and its editorial staff. In the industrial age being the BBC meant offering engaging, well-produced, trustworthy content delivered over robust, easy to use, egalitarian technology.

Summary: what the BBC has been

Taken together the BBC's mission to inform, educate and entertain, the key characteristics of broadcasting technologies and an ambition to deliver quality provide a sense of what being the BBC meant in the industrial age. They also provide a solid foundation for the corporation's evolution. Before we can turn to what being the BBC will mean in the information age we need to examine how society is changing as we make the transition from one era to another.

As you will know the concept of the information age describes the increasing prevalence of computers and networks that allow information to be shared rapidly around the world. We are only starting to understand all the implications of the information age. For the purposes of today I will focus on the key trends of the transition that are beginning to effect broadcasters.

Key trends of the information age for broadcasters

In 2005 the BBC initiated a project looking at its future in this new information society. Some of our audiences were beginning to behave differently and we could see the potential of some of the technologies moving into mainstream adoption. It was clear we needed to adapt the organisation to reflect this new context. At the time we identified a number of key trends that we thought would shape broadcasters in this new environment.

- The development of **on-demand** and time-shifted consumption
- Increased **choice** for audiences
- The advent of **user generated content**
- The rise **new competitors**

Along with our early moves on to the Web and our digital TV and Radio strategies, our response to these trends was the beginning of our answer to 'being the BBC in the information age'.

On-demand / time-shifting

In 2005 we thought that up to half of people's consumption of television would be outside of the linear schedule and Radio would be significantly affected by innovations like podcasting. In response we developed and launched the BBC iPlayer. In fact, more than five years later time-shifted viewing to television only accounts for less than 10% of consumption. We still believe that it will grow over the next five years but even 20% would be an aggressive forecast.

The concept of linear remains very important to people, they value the sense of curation, immediacy, relevance and connection that I believe being a broadcaster has always been about. I don't think this should be a surprise, both linear and on-demand appeal to part of the fundamental human condition. Linear addresses our desire to be part of a community and on-demand responds to our desire to be an individual and have things on our own terms. The transition from linear to on-demand was not a light switch, it is a pendulum that will settle somewhere in the middle now that technology has enabled it swing freely.

Perhaps the most surprising aspect of how this trend has developed is the resilience of linear television viewing. Despite society moving further and further into the information age people are now watching more television than before.

But

It also points to a complexity about the information age, or at least the beginning of the information age. Talking about 10% or 20% of viewing is speaking to an average that disguises an important insight. The transition from the industrial age to the information age is going to take a number of years and people will respond in different ways. We expect that for some audiences for some time there will be practically no time-shifted viewing or listening. For others it is already 20% and is likely to grow to 50% and beyond very quickly. The reality is that people's behaviour is fragmenting and they are developing different media habits. Organisations will have to respond to this phase of the information age

with a level of sophistication that was not demanded by the industrial age. For the BBC it means evolving our services so that they can appeal across these segments, so that a concept like 'BBC 1' can mean something as a traditional, linear television channel and as a complex, interactive, on demand internet experience.

The lesson for the being the BBC in the digital age from this trend is we will have to **re-define our concept of 'live'**

Choice

A second trend that we predicted in 2005 was an **explosion of choice** for audiences. To an extent this was played out in the early years of the information revolution through the development of multi-channel television and digital radio broadcasting. In both instances the BBC responded by offering additional channels and stations in order to better reflect our audiences increasingly focussed interests. The new channels and stations also helped retain the 'shelf-space' for the BBC in these new, enlarged television and radio environments. The strategy was successful with the BBC's share of consumption staying constant over the period and audiences responding well to the more specialised services.

In 2005 we were considering the prospect of more and more media consumption migrating to the web – an environment where there was effectively limitless shelf space and much lower barriers to entry for would be content providers. We were sure that this would lead to a second, more acute, explosion of choice and that the BBC would struggle to be heard amongst the cacophony. So far the BBC's television and radio services are proving remarkably resilience and our web-based services are increasingly popular. On the surface it looks like that impact of choice may not be as transformative as we thought but in reality what we have found is that choice is a more sophisticated challenge.

The advent of choice means that our audiences are no longer developing in the same way as before. Traditionally we have seen people's consumption of media decrease as they move through their teens and then return to higher levels as

they move through subsequent life stages. Younger audiences are encountering a greater range of increasingly sophisticated media services during their teens; the question for the BBC is whether following this experience they will ever return to traditional TV or Radio in the same way as before.

The second underlying data set we are beginning to see describes the rise of multi-tasking when it comes to media. Again this is especially relevant to younger audiences. For example, research by the regulator OFCOM in 2010 suggested that 16 to 24 year olds are cramming in nine and a half hours worth of media into six and a half hours of actual time. As we move forward into the information age it seems that the explosion of choice is not necessarily about managing and either / or decision but could be about how the BBC considers 'as well'.

The final kind of choice we now have to accommodate is the impact of what you could call 'device diversity' or the idea that audiences would be accessing the BBC through an ever-increasing combination of consumer electronics and networks. Since we began measuring mobile useage of bbc.co.uk in 2006 it has grown 640% and BBC iPlayer is now available on over 40 devices. In the network space we now have relationships with television platform providers, radio platforms, ISPs, mobile companies and even WiFi hotspot providers.

In understanding what the BBC should be in the information age what lessons should we take from the rise of choice?

First I believe that **quality** will always be important. As choice increases the BBC should focus on quality that stands out, both in terms of its output and in terms of the technology experiences it provides that output through. Quality is, of course, a subjective term but the ambition is clear. To reinterpret the BBC's relationship with its audience in the new context quality will always be important and should be the 'option' that the organisation offers within the ever-expanding sea of choice.

The second lesson is that our technology systems will have to evolve within this emerging context. We have to **integrate traditional technologies along side new platforms** to recognise the diversity of our audiences and unlock the creative opportunity offered by combining old and new technologies together.

User generated content

The third trend that we were focussed on in 2005 was the rise of **user-generated content**. At the time we were interested in how relatively cheap production technologies could be combined with the distribution capabilities of the internet to radically democratise media. The potential of this trend led us to question our mission to inform, educate and entertain. First through the prospect of 'citizen journalism' replacing how we might inform and then potentially the rise of YouTube replacing our attempts to educate and entertain.

In fact, once again we have come to recognise that these new behaviours and technologies are beginning to find a complimentary relationship with traditional ways of generating content. In the news space user generated content is often part of the story but our professional journalist also have a role in contextualising information from citizen journalist within the wider story. Our resources as professional content creators offer access and quality that together with the perspective of citizens create a much richer analysis of an issue.

Perhaps we misunderstood the true significance of 'user generated content'. I believe that a lot of the energy we expected to be devoted to user-generated content is being directed into social networking sites. Whereas we were expecting the trend to provide a huge volume of material spread across the web instead we have seen it build new communities in services like face book and twitter. These are environments that are better described as part of the internet than part of the web in that they have grown in very large but closed systems. Understanding how these new media spaces relate the space that the BBC curates will be key to our future. It is conceivable that social media environments will become more important navigational tools than the traditional electronic programme guides we are currently used to.

The key lesson we should take from the user generated content trend that we identified in 2005 is that audiences in the information age will have an increasingly interactive relationship with institutions. In the private sector this is often referred to as 'Customer Relationship Management'. It is already natural for your supermarket to keep your shopping list and provide offers on your favourite groceries. It is less clear what 'CRM' might mean to a broadcaster, especially a public service broadcaster such as the BBC. However, we are going to have to consider the dialogue we have with audiences carefully in the information age.

New competition

The final trend from 2005 I would like to discuss is the prospect of **New competitors** entering the media landscape. It seemed clear that as a broadcaster the BBC's competitor set was being expanded by the convergence that information age technologies was driving. We saw Internet Service Providers, Search companies, start-ups and mobile phone companies all evolving into areas where we traditionally focused our own efforts. Since 2005 this trend has materialised and there is no doubt that the BBC's competitors have expanded but at the same time we have continued to deliver to audiences. What is clear is that our new competitors are all operating at a global scale. I believe that the BBC will have to retain a similarly global outlook and relevance in order to continue to deliver its domestic purposes. We will need to be able to bring similar levels of resource to bear whether in gathering news or producing entertainment to reach our UK's audiences expectation that are being set by these global players.

Perhaps more important than new competitors is the impact that the information age has had on our traditional competitors. Amongst broadcast organisations we are beginning to see evolution along divergent trajectories as the difference between business models drive companies in different directions. Companies that are focused on subscription are developing a different approach to those who depend on mass advertising. The homogeneity and stability created

by the spectrum dependent technologies of the industrial age is being radically changed.

In the confusion created by disruptive technology and convergence I believe the important lesson for being the BBC in the information age is that we must look to ourselves to **define our role in relation to what we want to provide** licence fee payers and then acknowledge that we will perform that role amongst an increasingly broad and complex competitor set. It is about knowing who we are and not being complacent as the information age becomes fully formed.

So what will the BBC be in the information age?

First, we must retain the fundamentals. The BBC's mission to inform, educate and entertain is enduring and provides the foundation for our role in the future. Guaranteeing an agreed level of each, in a timely and relevant fashion, at high quality and available universally is even more important in an age that will be information centric. However the BBC must reflect the new context in the delivery of this mission.

The rise of on-demand shows us that we need to re-define what we mean by live to something that still reflects the national conversation but also reflects the fact the digital information remains available after transmission. Audiences will expect any part of that conversation to be available again at a later date and the BBC's archive will become increasingly important.

The proliferation of choice will mean that the BBC's role will need to focus on quality, both in our programming and in the technology that delivers it. However, high quality may embrace ideas such as how the BBC curates diverse information sources as much as how it produces its own programming.

The rise of user-generated content really points to the BBC becoming part of the information environment, connected to other networks. Whether this is 'customer relationship management' is another question but being a broadcaster in the information age will not be a one-way activity.

Our exiting competitors will develop away from us and new competitors will bring a global perspective to our activity. The BBC will need to define itself as a 'BBC' kind of broadcaster with the mission that implies rather than as part of an existing club.

A new broadcasting system

This brings me on to the second contention that I started this lecture with: that in order to be the BBC in the information age we will have to build a new broadcasting system that supports our reinterpreted role and a new context.

The idea of a broadcasting system is one that we have borrowed from Edward Pawley. He was one of our engineers and wrote 'BBC Engineering 1922 - 1972'. Pawley was very perceptive in understanding broadcasting as combination of elements from the creation of the programmes through to their distribution and consumption. The broadcasting system is primarily a collection of technologies but also includes regulatory, business and creative conventions. It is no surprise that as we move into the information age the changes it brings mean each of these elements and the system they create will evolve as well. I believe that as we see broadcasters diverge and new entrants come into what was the broadcasting space there will also be less homogeneity amongst the systems that support the activities of these increasing different organisations. The second half of my lecture considers how the BBC's broadcasting system will change to support its evolving role. I will not dwell on the regulatory and editorial aspects here but instead focus on the technology developments that BBC R&D and colleagues in the engineering areas of the BBC are working on.

While the technologies that Pawley wrote about have changed the framework he gave us is still important. Understanding it as a system allows us to think of it as chassis on which the BBC runs. It helps to consider how changing one element of the system will alter another and how you can join the pieces together to create something that is greater than the sum of its parts. The system can be split into four elements, production - the capture of material, media management - the

movement of material around the BBC, distribution – the movement of material from the BBC to its audiences and Audience experience – that last step where material is presented. When we talk about the new broadcasting system within BBC R&D we are talking about how each element is being upgraded to create a new chassis for the BBC in this new era.

Production

Production is the beginning of the chain and is essentially the capture of video and audio assets. The process by which this has been done has evolved gradually through the industrial age with incremental innovation in equipment like microphones and cameras but also unexpected innovations like outside broadcast trucks that also changed the way that broadcasters were able to tell stories.

The impact of the information age within the production space is even more radical. The process of capture is still understood within a paradigm of ‘filming’ and ‘recording’. The implication is that a production team, whether on location or in a studio, is using an instrument to take an impression of reality and committing it to a relatively static recording medium. In the new broadcasting system production moves to a paradigm of high fidelity data capture. The instruments will be multi sensor arrays that certainly capture video and audio but also capture other data sets – for example location, camera settings, light levels, script notes, temperature conditions, ambient noise, the list goes on. It is this concept of the data set that is most important.

The purpose of capture will increasingly be about gathering as much data as possible during a shoot with the expectation that those data sets will be manipulated in software later in the broadcasting process. Some data sets will be used directly in the creation of programming but equally the value of other data may only be unlocked years later when computing power and algorithms have developed to the extent that data that seems useless today finds a purpose. The advent of the information age changes the process of production from

marshalling scarce resource such as tape and instead requires the creative marshalling of abundance in order to find meaning.

Media management

The next step in the chain is media management – moving material around inside the BBC. The foundations of this part of the new broadcasting system will be a combination of networks, storage and algorithms.

Storage and the digitisation of the existing archive and future programming will allow us to maintain a digital memory for the nation that will be accessible. However once we've started we will never be able to stop. The BBC will face two kinds of storage challenge in the future. First a high availability challenge where the memory will want to be accessed rapidly by our own programme makers and potentially those outside the organisation. Secondly a long term, deep storage challenge where we will need to protect the archive as living digital asset. We have started an interesting journey in this space but I feel it is only the beginning. There are important issues with how we make this new approach sustainable but it will also create new versions of old challenges like ensuring a provable history and veracity for material.

Alongside storage our internal network will become a key part of the media management element of our new broadcasting system. We are already exploring how to move many of our enterprise applications into the cloud but as our equipment becomes networked and we connect directly to the wider internet the internal network becomes critical to the overall system.

Increasingly sophisticated algorithms will manipulate the data sets that are captured in the production process. Once we are working with data in software then new creative possibilities are opened up

- real time graphics
- multi-camera views
- mood detection for discovery

Distribution:

This leads me to the third element in the overall system – distribution, the process of getting our material to our audiences. You might expect me to say that the new broadcasting system will use an all IP distribution network. This is an area where physics helpfully steps in and tells us that the business of broadcasting will always involve providing the same thing to many people at the same time. Broadcast technologies are optimised around those parameters, whereas the internet has other advantages. In fact we are developing a hybrid model where broadcast distribution technologies sit alongside internet delivery technologies. We have recently upgraded terrestrial television broadcasting to the DVB-T2 standard that allows us to provide both HD and potentially mobile coverage. At the same time are also working on moving our programmes more efficiently across the internet. For example last September we conducted a test of Super High Vision (16x the definition of HD) with NHK, the Japanese public service broadcaster. Together we successfully sent SHV broadcast signal from BBC Television Centre to Tokyo using the world's research networks.

There may be a moment when internet bandwidth is so abundant that the compromises to mass delivery no longer matter and we have long-range research projects looking at an all IP future. For the time being however we see the value in combining both sets of technologies so that each can offer what they are best suited to providing and together create something far more exciting than either in isolation.

This creates some really interesting problems like how you synchronise material delivered over a broadcast network with the material delivered over the internet. If we are able to solve this type of challenge then we will be able to unlock the potential of a hybrid topology.

There is another reason why we are maintaining a hybrid architecture for the distribution element of the new broadcasting system. For all its advantages the internet is fundamentally a composite of many networks. This creates

robustness through multiple failure points but it does not provide a broadcaster with a direct unmediated connection with its audience. You will remember that I suggested that being able to guarantee access underpin the concept of universality that will still be one of the defining characteristics that the BBC carries forward into the information age. Having a broadcast path to audiences alongside the internet is not something we should abandon in the information age, especially if the value of the broadcast path can be amplified by the internet.

That is not to say that the new broadcasting system will not create significant change in this area. As I have said we will have to work hard to achieve a seamless integration of the two paths, we will also have to look at what parts of our editorial portfolio are relevant to which technologies. Ultimately this might lead to more innovative uses of both our spectrum and internet infrastructure to support the delivery of our purpose in the information age. Examples would be developing whitespaces to enable rural broadband access or to help audiences move material around their homes. Equally our internet activity may need to extend further into the network to create the kind of robust experiences audiences expect of a BBC service.

Audience experience:

The final element of the broadcasting system has always been something we now call 'audience experience'. This is the last element where material is presented to the audience. Traditionally it is an area that has been taken for granted but that was largely due to how stable it had been for so long. We had got used to radio or television receivers just working when they were switched on and finding the BBC when you pressed '1' or tuned into a specific frequency. The early years of the information age began to change this element with the rise of the electronic programme guide. As digital technologies take hold the creative opportunity within this element of a broadcasting system increases significantly.

- Context

We will continue to focus on areas of the Audience experience where we have traditionally been strong, for example in access services for the disabled.

Subtitling and audio description were important developments and also support the universality characteristic I have said is so intrinsic to the BBC. The information age will require us to put a lot more effort in the audience experience part of the new broadcasting system. Areas such as interface design and subtitling all go together to create the context around our programmes. This context is fundamental to how we deliver our mission as the BBC.

- New editorial formats

We are also looking at how digital technologies affect the programmes themselves. The information age will usher in new editorial formats that reflect the potential of the technology available and the evolving behaviour of audiences. The pace of change will be different within different genre, you could argue that News has already undergone a radical transformation but other genres remain broadly the same as they were 20 years ago. Ultimately the new broadcasting system will have to accommodate the most durable of the established editorial formats and also interesting new ones that are developed through trial and error. We are experimenting with editorial colleagues to understand the limits of what is possible so that we can shape the new broadcasting system appropriately.

For example over the last year we have worked with the production team behind Autumn watch to create a programme designed to be consumed over two screens simultaneously – the traditional television and a tablet device such as an iPad. These kinds of synchronised experiences provide an exciting new creative palette for programme makers but have implications across the whole production chain. We have also worked on new ways of telling stories on the web. One of our teams created the 'mythology engine' which is an experiment to show how audiences might navigate the universe of Dr Who that the BBC has created over many years by entering the mythology through different routes. This allows them to see how the events in an early episode might relate to characters or storylines in the modern series. It's a fun experiment but you can also see how the editorial format could be applied to help people understand more serious topics like the history of the Middle East conflict.

- Enabler components

One of the issues that the idea of context and new editorial formats creates is that of what you could call 'enablers'. These are network components that unlock the potential of the information age. Examples are a digital identity or a location. These could apply to people or things but they are the components that will stitch the information age together and enable the BBC's services along with everyone else's. As part of our work on the new broadcasting system we are looking at how the BBC can use these enabler components and which we should contribute ourselves.

System-wide considerations

By gradually upgrading each of the elements we are beginning to see the new broadcasting system emerge. There are some important system-wide design considerations that underpin our thinking and begin to create the hole that is greater than the sum of its parts.

Immersive / pervasive

The first of these considerations is the conflict between immersive and pervasive experiences. The new broadcasting system will have to accommodate a much wider set of parameters.

The existing broadcasting system was largely optimised for relatively stable parameters. By that I mean that we expected to broadcast to a specific place – the home, to standard receivers and crucially at a standard fidelity or definition. There are obvious inaccuracies with this statement such as radio in cars of the advent of colour television but the breadth of parameters that the existing system addressed were relatively narrow and stable.

The new broadcasting system has to address a much wider and more ambitious range of parameters. The phrase that we use is that we expect the new broadcasting system to accommodate the parallel provision of pervasive and immersive media. The system needs to be able to provide pervasive media as part of a pervasive information system. The implication is that we will need to

address the multiplicity of mobile devices and, over time, even ambient digital screens as more of our environments are networked. This is a significant technical undertaking but the implications of how you might design an editorial service for that context are also very challenging.

At the same time the new broadcasting system has to address increasingly immersive media expectations or the continuous evolution of compelling, realistic media experiences. We are already in the process of shifting from standard definition to high definition in television but we also need to consider 3D and Super High Definition (16x the definition of HD). In radio we are experimenting with 3D sound and online you can imagine the immersive experience that systems like second life hint at being Incorporated into the BBC's broadcasting system over time. We already have an immersive online environment for children called adventure rock. As ever our young audiences are showing us the future.

The way that you might design a technology system to provide a pervasive or immersive experience is often in conflict, nevertheless the new broadcasting system will have to adapt.

IP end to end

The second system wide consideration is 'IP end-to-end'. 'IP end-to-end' describes the concept that each element of the overall technology chassis will be linked through internet protocol. It is an easy thing to say but not easy to achieve in such an established industry but it is a change that is already beginning; the BBC has started to roll out a tapeless production system and we are seeing that joined up with our increasingly digitised archive. Believe it or not we have not yet linked our production systems and transmission systems over IP. Ultimately we hope to link data directly from cameras and microphones at one end of the chain all the way to multiple, networked devices in audiences homes. It is only when there is this level of integration I think that the truly transformative impact of the concept will become apparent.

The idea that stories might be created in a studio space where all the cameras, lights and microphones are networked and that this material can be passed throughout the rest of the BBC being processed by powerful algorithms and then passed directly to audiences anywhere in the world is exciting in itself. I also think that if the vision of IP end-to-end is fully realised it will mean that the BBC's new broadcasting system will be networked into the myriad of information systems that are developed in the information age. This interconnection is critical.

Integration of the new broadcasting system with the wider development of the internet

What the new broadcasting system will bring to its corner of the internet is perhaps the most important thing I want to explain this evening.

Digital public space

In 2009 Mark Thompson said that BBC creates a cultural public space. He meant that it occupies a third space between the market and the state, alongside our parks, museums and indeed, universities. While we have many institutions that create the public space they share some important characteristics that relate to my earlier discussion about what defines the BBC. It is fundamentally a not-for-profit space and in the case of the BBC it is also free at the point of use. For the BBC it also means reaching out across the population by offering something for everybody. Public space is a shared space, you can't buy a better service from the BBC no matter how wealthy you are just as our national parks or museums are shared by all. Finally for the BBC public space is also an independent space where opinion is not constricted by either market considerations or the state.

As we collectively design the information age we are making choices about how this new society will be constructed. Being the BBC in the information age means maintaining the third space for future generations living in this era. I believe that the BBC's new broadcasting system will help to secure a digital public space and will part of a collection of networks within the internet that define the third space in the information age.

I also believe that ensuring that people's experience of the information age includes the equivalent of public space is critical to unlocking the benefits of this chapter in the human story; just as public space played an important part in the industrial age. Exactly what a digital public space will be is not yet clear but I am convinced that it will involve many people and many organisations. Being the BBC in the information age means being a catalyst in this process and we are looking forward to working with industry, government and academia. A new broadcasting system that provides the chassis for the BBC in the information age but that also plays a role in the wider information ecosystem is what we really need to achieve. This sounds ambitious but in many ways it is the equivalent of what was achieved by our predecessors in the industrial age.

As many of you will know Professor Barlow was a member of the BBC's Scientific Advisory Committee from 1953 to 1976. I have no doubt that he and his fellow board members, as well as the engineers working for the corporation at the time found the potential created by new technologies initially daunting. However they persevered and evolved a broadcasting system that had a remarkable positive impact both in the UK and around the world. I believe we should take their efforts and success as an inspiration as we move into this new era where information is going to play an even greater role in people's well being.