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Picture Radio: Will pictures, with the change to digital, transform radio?



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Picture Radio: Will pictures, with the change to digital, transform radio?

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Abstract

This work looking at radio over the last 80 years and digital radio today will consider picture radio, one way that the recently introduced DAB¹ terrestrial digital radio could be used.

Chapter one considers the radio history including early picture radio and television, plus shows how radio has come from the crystal set, with one pair of headphones, to the mains powered wireless with built in speakers. These radios became the main family entertainment in the home until television takes over that role in the mid 1950s. Then radio changed to a portable medium with the coming of transistor radios, to become the personal entertainment medium it is today. Chapter two and three considers the new terrestrial digital mediums of DAB and DRM² plus how it works, what it is capable of plus a look at some of the other digital radio platforms. Chapter four examines how sound is perceived by the listener and that radio broadcasters will need to understand the relationship between sound and vision. We receive sound and then make pictures in the mind but to make sense of sound we need codes to know what it is and make sense of it. Chapter five will critically examine the issues of commercial success in radio and where pictures could help improve the radio experience as there are some things that radio is restricted to as a sound only medium. This will be considered to see whether radio can be improved with graphics and pictures. Chapter six will provide a background to the equipment available for the reception of digital radio and the receivers needed for picture radio. In addition the type of programmes that could be enhanced, as other media has, by the use of pictures and illustrations will be considered. Also there will be a critical discussion on the use of picture radio worldwide and the place of picture radio in international radio broadcasting.

¹ Digital Audio Broadcasting, terrestrial digital radio.

² Digital Radio Mondial, digital radio for the lower broadcast bands.

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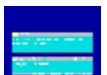


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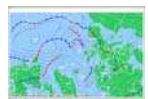


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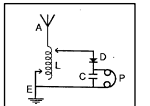
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Introduction

This work, looking at radio over the last 80 years and digital radio today will consider picture radio, one way that the recently introduced DAB¹ terrestrial digital radio could be used. Today we have new digital radio transmission formats that can give near CD quality sound and extra information. This could change radio with the possibility of adding running text, graphics and pictures.

Research Methods

The research will be using secondary sources for a critical examination of digital radio. This will include how technology has shaped radio in the past, how we perceive sound and vision, which radio programmes to add pictures to, radio receivers and a critical world overview of picture radio. To resolve from the research the possibilities and what types of illustrations to use for picture radio. Sources will be used constructively to provide answers to these research questions and indicative pieces are indicated in the appendices key references.

The debate

Will picture radio improve the radio experience or make it less pure, a cheap version of television? The debate whether to add pictures to radio has been going on since the early days of DAB radio. Speaking in 2001 at a Radio Festival Don Bogue, CEO of Command Audio, warned the UK digital radio industry that the personalization of services would be the crucial factor in creating the mass market.

¹ Digital Audio Broadcasting, terrestrial digital radio.

“The radio industry needs to begin to develop new programming concepts around the idea of a personalized medium with radio on demand. People don’t want radio with pictures.” (Centaur 2001)

On the other side of the debate according to Fraunhofer-Gesellschaft, with Picture Radio small but dynamic pictures can be used to enhance the programmes. They would have to be small, as the audio broadcast channels are about 30 to 50 times smaller than a television channel. A typical resolution for Picture Radio is 320 x 240 pixels @ 8.33 frames per second. TV is 720 x 576 @ 25 frames per second. (Fraunhofer-Gesellschaft 2001) Both sides of the debate agree that new content is needed to make DAB different from standard radio.

The commercial radio networks will want to use their multiplex to put the maximum number of stations into it. There are also many that do not want to use too much extra data as it would cut down the number of channels they could use. So as picture radio would use more than its fair share of a multiplex space there would be a strong case for not adopting it. However, as a DAB multiplex has to put some space in a multiplex for data transmissions there is no technical reason not to use some of it for new data extras for radio programmes. Cost and safe programming have stopped many stations from trying any new formats. The data is for the most part used for EPG and text, station name and programme information.

Cost, especially for the smaller broadcasters, would be a strong reason for not taking up picture radio. Although its costs should be a lot lower than television, video and film, the DAB images can be a smaller format and can be simpler than television, video or film.

Using basic slide show software the cost would be reasonable; production of picture radio could be made on a standard PC with basic media software. Broadcasters large and small will not risk something new, which will mean them having to spend on new production staff and equipment as well as risking the loss of listeners. Commercial radio needs to look after its share holders as it is a business. Many of the larger broadcasters such as the BBC have large resources including a video and picture archive, which they can tap into, making production much easier for them.

Chapter one analyses the new medium from an historical perspective including early television and picture radio systems. Early radio was well supported when it started in 1922 with the first popular receivers, the crystal set, with one pair of headphones becoming a personal listening medium. Then by 1930 with improved components and new valves cheaper mains powered radios, with built in speakers, were on sale and radio became the main family entertainment in the home until television took over that role in the mid 1950s. Then radio changed, first with the introduction of FM radio, which improved the quality of the sound and reception. However and more important, VHF FM made the return of local radio possible. With the coming of transistor radios, in the late 1950s, radios became cheaper and a portable medium. This was the beginning of radio becoming the personal entertainment medium it is today.

Chapter two and three will consider the new digital medium of DAB and DRM how it works, what it is capable of, plus a look at some of the other digital radio platforms. DAB, digital audio broadcasting is a terrestrial network that can have near CD quality sound. DAB started transmission in the United Kingdom in 1995 although the first receivers were not put on sale to the public until 1997.

Chapter four examines how sound is perceived by the listener. We receive sound and then make pictures in the mind but to make sense of sound we need codes to know what the sound is and to make sense of it. Consequently radio needs extra words to make the sounds work. Radio was making sound work as early as 1924 with programmes written and made for radio. Radio broadcasters will need to understand the relationship between sound and vision to keep radio separate from other media.

Chapter five analyses the debate for and against picture radio. Will it improve the radio experience or make it less pure, a cheap version of television? Limited text is already available on FM radio; DAB has more data capability so the next step would be to add graphics and pictures, which DAB transmissions are capable of sending to a suitably equipped receiver. However, many broadcasters are happy with what we have now and their only interest in DAB is the number of extra channels that are available. Another issue is that there is also an extra cost of adding the extra services, graphics and pictures, to radio. There are a limited number of receivers that could process the information and manufacturers would be cautious in investing in a new, untried system. However, for DAB to succeed it may need something extra to make it a success.

Chapter six will provide a background to the equipment available for the reception of digital radio and the receivers needed for picture radio. In addition, the type of programmes that could be enhanced, as other media has, by the use of pictures and illustrations will be considered. Also there will be a critical discussion on the use of picture radio worldwide and the place of picture radio in international radio broadcasting.

Many of the large media corporations now cross-promote their branded content across different audience platforms (Tim Dyer 2010:48) and less of the 15 to 24 age group are listening to the radio today which is down by 3% year-on-year. With web sites such as MySpace and Facebook as well as a general increase in web usage it means younger listeners are spending time elsewhere. (Broadcast 18 May 2007) Terrestrial broadcasting needs to consider convergence with other media platforms in order to remain relevant to today's consumer. (Eureka May 2010) Today with the introduction of digital radio there is now the means available to make a change to radio with the inclusion of text, pictures, and surround sound which can also run on many platforms.

Chapter One

Radio and Television from the 1920's

Introduction

The first chapter will examine the background of radio from the 1920s and show that picture radio is not new and technology has been used to improve radio over the years covering many changes that have shaped it over the years. This will emphasize how technology has helped change and influenced the way radio has progressed over the years. Also early television will be included because this was often treated as picture radio in its early days and could have stopped radio developing if television not had such a slow start. The early days of radio and television will give an insight into how sound and vision was presented in a new medium in its early days.

This chapter starts at the beginning of public radio broadcasting in the United Kingdom. The British Broadcasting Company under the control of John Reith was created and became the monopoly United Kingdom broadcaster this gave birth to a new form of mass communication. The 1920's was a time when radio broadcasting started around the world with two main types of radio organisations, state controlled monopoly and commercially run radio. In the United Kingdom the BBC was to become a radio system something between an unregulated American style commercial radio and the highly regulated radio favoured by the new Soviet Union.

Radio in its early day experimented with the addition of images and text. Television developed from the adding of video but the technical constrains, economic condition and war, stopped the development of printed text and images added to domestic radio.

The Early Years

Between 1920 and 1922, before the formation of the BBC, a few large firms in Britain were given licences to broadcast radio experimentally. The wireless telephone broadcasting service, from the Marconi's works transmitter on 2,800 metres long wave, from Chelmsford 30 miles north east of London, was among the first to broadcast short weekly programmes of wireless telephony and Morse calibration for the benefit of the several thousand amateur wireless experimenters around the country. (Hill 1993a: 34)

The radio broadcasts of wireless telephony contained music, as well as news bulletins and included a broadcast by the famous Australian soprano, Nellie Melba, on June 15th 1920. (Hill 1993a: 32) The power of the transmitter was increased in February 1920 and a regular service began with two half-hourly periods each day of news, talks and music. These transmissions could now be picked up with good quality reception up to 1,200 miles on a crystal set and 1,400 miles with a valve receiver. (Hill, 1993a: 30) Concerts from Chelmsford were received by wireless in Europe and at many telephone exchanges of large towns they were then sent to subscribers' lines. (Pearsall, 1976:119) The music encouraged listening-in by radio operators at sea and amateurs at home. This started a demand for more receiving licences and receiving equipment. However, on November 23rd 1921 the Post Master General withdraw permission for Marconi to broadcast from Chelmsford because of considerable interference with other stations particularly the Post Office's new transmitter near Oxford. (Hill 1993a: 32) But after pressure on the government the Post Master General authorised on the 25th January 1921 the Marconi Company was able to resume its tests of wireless telephony and Morse calibration with one half-hour programme a week. (Hill 1993a: 34)

In 1922 the Post Office, as the agent of the British Government, licensed the six major radio manufactures and other smaller companies to form the British Broadcasting Company. This new company was funded by a licence fee of 10 shillings [50p], of which the BBC received half, this was payable by anyone owning a receiver, and this was supplemented by royalties on the sale of new radio receivers. The Government initially kept strict control over the operation of the BBC, particularly in the case of controversial matters. (Cain 1992: 9) With time, confidence in the BBC's ability to handle political and other issues impartially grew. So despite charges of bias from the fringes of the political right and left the Government's attitude towards control of broadcasting slowly changed. The ban on controversial broadcasting was experimentally removed in 1928. This allowed the BBC to broaden its programmes including in November 1929, the introduction of *The Week in Parliament*, which became, a few months later, the long running *Week in Westminster*. It was now up to the Governors and the Director-General to decide what should be broadcast. (Cain 1992: 25)

In January 1927, the British Broadcasting Company changed to the British Broadcasting Corporation, which was created by Royal Charter. With anomalies and loopholes in its royalty and licensing arrangements the BBC was short of revenue, and in 1925 the government set up the Crawford Committee to consider the future of broadcasting. This situation suited John Reith, controller of the BBC, who wanted the BBC to become a public institution free from commercial and political pressures. The Committee had similar ideas and as a result of its recommendations, the British Broadcasting Corporation, was set up by Royal Charter on 1 January 1927. (Crisell 1994: 20) The new Corporation took over the staff, studios and transmitters of the original British Broadcasting Company, which was dissolved on December 31st 1926. The new

corporation starting the next day. John Reith became the first Director-General and saw to it that his policies of the old BBC were carried out. This was to 'Give the public something slightly better than it now thinks it likes.' (Paulu 1956:144)

Early radio receivers

There was much surplus World War One radio equipment around at the commencement of the BBC and with the BBC there to support radio the new electric entertainment media quickly expanded. The first radio sets were priced from about £1-00 for the cheapest crystal set to over £65-00 for a top of the range multi valve set. With an average take home pay of about £3-00 a week in the early 1920's a good valve radio cost as much as two or three months wages (Hill 1978: 44) By way of comparison the £1-00 crystal set was about the equivalent cost of the first high-volume DAB digital radio that sold below £100-00 [£99-00] in 1992. The crystal set soon became popular and the price soon fell to around 10s [50p].

Early radio receivers looked like scientific equipment. (Figure 1) This four valve Vitus Neutrodyne Receiver of 1925 was made for the wealthy amateurs who also had sufficient technical knowledge to operate them. The crystal set was the most popular as it was affordable (Figure 2) and



Figure 1. 1925 Vitus Neutrodyne Receiver.



Figure 2. Crystal set.

was the simplest receiver using a mineral crystal as a detector and few components.

(Diagram 1) The received signals were not amplified and the crystal sets could only pick up a usable signal if it was used within 10 miles of a transmitter. The early BBC transmitters were of relatively low power and were designed to serve the immediate local area only. The crystal sets were designed to be used with a single pair of headphones; it was a personal listening experience like the Walkman receivers of today. (Hill 1993: 8) These early radio receivers were fixed to an earth wire

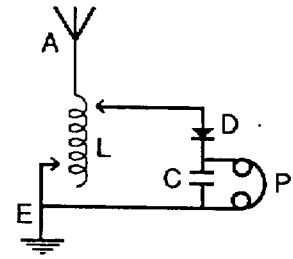


Diagram one. Simple crystal set of the early 1920's: A, aerial; C, variable condenser; D, crystal detector; L, tuning coil; E, earth; P, headphones.

and a long outside aerial, the listeners licence permitted the use of up to 100 feet of aerial wire, (Hill 1978a: 24) fixing them to one room of the home unlike today's portable radios. For those who could afford it, a battery valve receiver improved the reception and sound quality, with many able to drive a loudspeaker, thus allowing the whole family to gather around the radio and listen together. Valve radios cost a lot to run as the batteries had to be charged and replaced. The batteries for the valve heaters had to be charged about once a fortnight at the local garage and would cost 6d a time [2½ p] or about £2-50 today. (Hill 1993: 10) The working classes were not able to afford the early valve sets, although the prices were dropping, a two-valve set was available for five guineas in 1925 but this was well beyond their means. (Crisell 1994: 19)

Others obtained their radios on hire purchase or rented them. The age of consumer electronics had started. (Cain 1992: 20) For those who could not afford a radio even as early as 1924 there were the relay exchanges, radio sent to your home by cable, where a central receiver was wired to a loudspeaker in individual homes. This was not new, as many telephone companies had sent entertainment over their lines since the start of the

telephone in the late 1800's. Also when radio broadcasting started the gramophone was becoming more affordable and introduced popular songs to many people. The 1920s was the first age of background music. In the 1920s, more music was heard than ever before, a popular song could now reach more people on one night on the wireless than could ever be heard in the flesh. (Pearsall 1976: 84)

Early BBC radio programmes

The BBC, which shaped for many years broadcasting in the United Kingdom, quickly became popular, it had a mix of programmes to educate, inform, and entertain. The BBC, which started under the control of John Reith whose policies of giving worthy programming, saw that popular programmes were limited in the UK. However this did give the BBC many quality programmes. The BBC followed the general mood of the establishment its officials knew that they were right to dictate what the listener was to hear. This did not permit any working-class participation in popular music and music made by and for the mass of the people. This did not change until the arrival of commercial television in the 1950's when the BBC's monopoly of broadcasting ended. (Pearsall 1976: 134) Having paid a licence fee the listener would listen to anything including the dull BBC Sunday programmes. On a Sunday, with a later start time of 3pm, the BBC would put on 'restrained' programmes leaving out any variety shows and dance band entertainment. More hours of Sunday radio in 1932 with an earlier start time of 12-30 did not improve the dull Sunday listing, as the first programme was 'Sunday Dinner Programme' of Organ Recitals from 12-30 to 1-00 pm followed by the Reginald King's orchestra with a selection from Rose Marie, The Moonbeams Dance and Love Come Back To Me. (Hill 1993a: 103) For the rest of the week there was still worthy programming which included drama, variety, talks, children's programmes, popular plus

classical music and some news. The programmes were made for an audience that today is catered for by BBC Radio Three and BBC Radio Four. (Pearsall 1976: 130)

BBC News

News and sport, an important ingredient of radio today, were restricted in the early days of the BBC. The news had to be supplied by existing agencies and was on only after 7 p.m. to avoid upsetting the newspaper owners. (Cain 1992: 11) The popular press resented the monopoly enjoyed by the BBC and were scornful of the strict regime imposed on listeners of news, weather, and concerts. The Daily Express declared that the monopoly was 'a cause of muddle and exasperation with poor programmes and the listening-in licence a needless charge'. They looked longingly at the United States free-for-all, where listeners got what they wanted, not as in Britain, where it was a case of what the BBC thought they ought to have. (Pearsall 1976: 121)

The first improvement in news coverage came with the General Strike of May 1926 with five bulletins spread throughout each day. As there were no regular daily newspapers during the strike the BBC became the main supplier of news. (Cain 1992: 15) The time devoted to news increased and by 1932 more of the news coverage was from the BBC's own news department. (Cain 1992: 25) At first the sporting authorities had refused to permit broadcasts for fear of attendance figures being harmed. It was not until 1927 when the first running commentary for a sports event was broadcast, England v Wales rugby at Twickenham. This started a long run of live major sporting events broadcast by the BBC (BBC 2001)

Expansion of the BBC

As there was no alternative the mass of the people accepted what they were given. An indication of the appeal of wireless can be gauged from the sales figures of the *Radio Times*, a quarter of a million, when it was first published in September 1923 (Pearsall 1976: 121) Radio quickly expanded and by the beginning of 1926 there were 1,840,268 licensed listeners with over 3 million by 1930. (Hill 1993a: 226)

The BBC was broadcasting from London and regional centres around the country on the medium wave band. The range of the transmitters was limited to 20-30 miles. To get round this 'simultaneous broadcasts' were set up. By using post office lines a number of low-power transmitters were used to extend the range of regional broadcasts. This simple technical solution expanded the new radio system, so that by September 1925 40 million people could pick up BBC signals. To give the country a national programme a high power long wave transmitter at Daventry opened on 27 July 1925. At the time it was the biggest in the world, and the signal could reach virtually the whole nation. (Cain 1992: 17)

The start of television

Radio was limited to sound only so the addition of pictures was the next development. Practical experiments were taking place in the 1920's these were based on the inventions and discoveries of many scientists. (tvhistory 2004) With the introduction of valves and light sensitive cells, a light-sensitive selenium sensor which produced the electrical pulses, it was now possible to transmit pictures in smooth grey tones. In the United Kingdom John Logie Baird using an electronic mechanical system showed the first live television broadcast to the public in 1927.

Baird's television was, from the outset, made to use the existing broadcast infrastructure thus minimising development costs and expense to the consumer. To receive the pictures the viewer had to buy another radio receiver and a 'Televisor' (McLane, tvdavn 2003) as the only transmitters available were in the radio frequencies, with a bandwidth limit of 9kHz, Baird's television was limited to only 30-lines. ((McLane, tvdavn 2003) The 30 lines give a small picture of limited quality (Figure 3) for a face, an acceptable half tone picture could be made with 50 lines at 16 fps, however this would need a bandwidth of 20kHz. (Burns 1986: 68) There is a 'super-resolution' effect as objects move across the 30-line frame and this gives the effect of having more detail. With a human subject, the brain contributes a substantial 'recognition' capability but with static subjects like landscapes and buildings, the image is often totally unrecognisable. (tvdavn 2003)



Figure 3. 30 - line image

The Plessey model 'Televisor' was the most popular mechanical television made by the Plessey Company for Baird. (Figure 4) About 1000 'Televisor' were produced priced at just over £18-00 each. There were also kit receivers, without the tin cover, at £7-00.

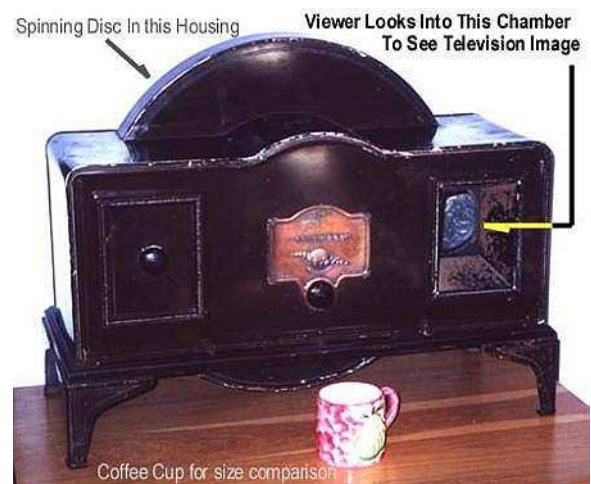


Figure 4. Baird Televisor 1929.

(mzvtv 2004) Television enthusiasts were able to watch periodic Baird studio and later BBC experiential test broadcasts from 1929 to 1932. A programme milestone was in 1930 when the first British television play, "The

Man With the Flower in His Mouth"¹, a talkie by radio that consisted of close ups was broadcast. (Burns 1986: 151) With the small low quality images this would be more like picture radio than television.

As Baird had only AM to work with he had limited bandwidth to use for his early experiments. Having to use a separate transmitter for the video would have been another limit to using a television system in the radio bands which were filling up fast. When Television, as we now know it, was started it was to use the higher VHF broadcast bands. Baird did his best with the limited equipment then available. Today with digital radio it is possible to fit much more information into the limited radio spectrum as well as the AM bands this can include small videos and picture slide shows.

Pictures by radio

Television was not the only picture transmission system to be introduced still pictures of major events could now be sent around the world in just a few hours after they happened. One such system was the Bartlane system, the primary means for news picture transmission before World War II. (McLane, tvdawn 2003) Edouard Belin of France introduced a wireless transmission of photographs. In Belin's system the photograph first had to be turned into a relief etching in which the darker area was the deepest part of the etching. It was then scanned by a stylus connected to a variable resistance; the deeper the cut, the more current flowed. The process was repeated at the receiving end to produce an etching on which an image could be printed. In 1907 Belin transmitted a photograph from Paris to Bordeaux and back to Paris. Also in 1921 Belin sent the first transatlantic

¹ Luigi Pirandeeello's "The Man with the Flower in His Mouth" was transmitted from the Baird studios in London on 14th July 1930. For the first play from Baird's modest studio, Val Gielgud, the productions director, chose one with only three on-screen characters. (tvdawn 2003)

picture gram from his laboratories in La Malmaison to Annapolis in the United States. His equipment was adopted in Britain in 1928 and used almost exclusively by European news media during the 1930's and 1940's. The term Belino came in general use for all kinds of picture transmission. (digicamhistory 2004)

Before the BBC's interest in the 30-line Baird television system they had transmitted experimental still pictures, during some afternoons of the week, using the Fultograph process. The Fultograph had been invented by Otto Fulton and was first shown to the public at the 1928 Radiolympia by its manufacturers, Wireless Pictures (1928) Ltd. (Figure 5) the first

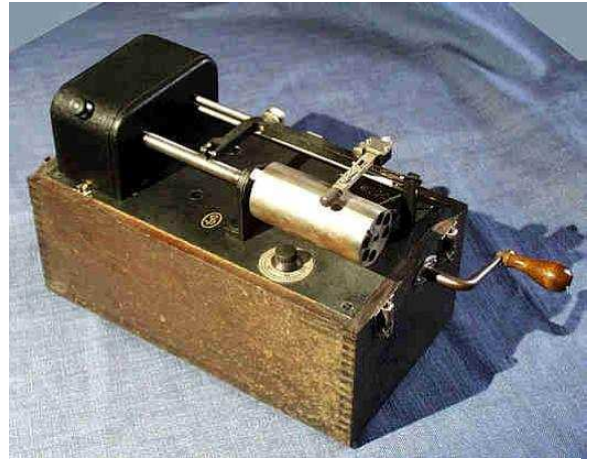


Figure 5. The Fultograph.

tests began on October 30th 1928 and run until October 31st 1929 from the Daventry long-wave transmitter. Then after a short pause the tests changed to 261.3 metres MW and continued until June 21st 1932. The Fultograph unit was simple to install. It was simply connected in place of any radios loudspeaker. Topical news pictures, cartoons and fashion plates were being broadcast and images could be received from several continental stations as well. *Television* magazine was not happy with the BBC's experiments with the Fultograph believing that the broadcast of still pictures would be a hindrance to the development of television. (Hill 1993a: 61) The cost of a Fultograph receiver, in an oak case was £22. 15s. 0d with a kit for the home-constructor costing £15. 0s. 0d. The receiving mechanism was mounted in a case comprised of a rotating clockwork-driven metal drum, which resembled a cylinder Edison phonograph, which had a piece of blank sensitive paper fixed to it. When a signal was received the drum

automatically began to turn and a stylus travels along the drum building up the image on the paper producing a printed 4"x5" Image. (Hill 1993a: 61) It took about 4 minutes to receive a picture with early pictures reproduced at 300 to 350 pixels, which later, improved to 700 to 800 pixels. (Objekt 2004) In the USA they also had an experimental radio facsimile service in 1939 with three important radio stations, WGN, WOR and WLW transmitting a regular schedule. Factory made receivers of medium price were being produced. The coming of World War II was to stop these picture radio experiments. (modernmechanix on-line 24-1-10)) Today digital radio can have live pictures sent to a receiver with a built in display.

Radio in the USA

Radio was starting worldwide, and in the USA, which was in a healthier economic state than the UK, radio developed much faster than in the UK. With an entrepreneurial frontier spirit, early radio development, in the USA become a piecemeal regional development of commercial radio stations rather than a unified national system. (Cain 1992: 8) The early experimental programmes encouraged unofficial listening-in and in the USA the radio manufacturers found a demand for receivers. This encouraged manufacturers including the Westinghouse Corporation, one of the first major corporations to manufacture inexpensive radio receivers, to set up transmitting stations for the general public. (Cain 1992: 114/5) The stations were financed by broadcasting commercials and had much more popular radio programming than in the UK.

In the USA, the radio stations grew faster than the new frequencies being released. The government, who controlled the available radio frequencies, was slow in releasing new frequencies. With no regulation on the number of radio stations that opened many

interfered with each other. This meant that some had to increase their power to drown out another broadcaster or had to move to new frequencies. This gave a poor service to the listener and poor income from advertising without a regular audience. (Fang 1997: 116/117) The United States radio business at this time was divided into independent and network-affiliated stations with most programmes aired in 15-minute blocks. (kclibrary: 2004) Radio station owners asked the government for regulation and the government called four conferences. These were stormy affairs with many station owners wanting to limit competition, the smaller stations were distrustful of the larger corporation stations, and no one was quite sure how to finance the radio industry. (Fang 1997: 116)

Regulation was finally agreed with the intention of expanding broadcasting, not limiting or censoring it. It took until 1927 for the Radio Act to be passed and was later broadening into the Communication Act of 1934. With regulation the people who obtained a license now had a stable business to run and the government now had some control over broadcasting (Fang 1997: 117) The British Government had moved more cautiously with the BBC with the controlled monopoly funded by a licence fee. The USA advertisements were regarded as vulgar and intrusive (Cain 1993: 9) but the government and the BBC did not object to advertising as such with some of the early BBC programmes receiving sponsorship (Sterling Times 2004)

Radio receivers in the UK 1930's

By the end of the 1920s, radio was becoming more popular with nearly three million radio licences issued. The first mains powered table radio with a built in loudspeaker was introduced in 1927, the PYE Model 275 AC. The new design was quickly adapted by many manufactures and by 1930 the mains receiver with their built in speakers, attractive cabinet, modern styling had appeared this established the style for radio receivers for

many years to come. (Figure 6) A mains powered radio cut the running costs of radio ownership as the owner no longer had the expense of buying the 13s 6d (67½p) HT batteries and getting their LT £1/5s (£1-25p) 4v batteries charged. (Hill 1978a: 47) The spread of the National Grids in the 1930's brought a standard mains electricity supply to many homes, which also helped to establish the mains powered receiver. (Hill 1993: 16) In 1930 75% of homes still had to use batteries to power their radios with only 30% of homes in England,



Figure 6. PYE model AC4D 1930.

Wales and Scotland having access to electricity, this was distributed equally between AC and DC supplies. Those who converted to electric could buy a relatively cheap battery eliminator and use it to power the battery radio directly from an electric light socket. As the national grid scheme progressed the mains radio became the choice of the listener. (Hill 1993a: 96) Also a stable standard electric supply made mass production of radios viable, therefore, cheaper radio for the consumer. A mains radio was more efficient, it was cheaper to run, and did not lose power as a battery radio will with a corresponding drop in efficiency.

With new valves and mass production, the early 1930s saw the mains radio, with its built in speaker, become the dominant receiver which soon became a piece of furniture called the wireless. These radios were often large pieces of furniture that still needed a long fixed outside aerial wire for good reception, although an indoor frame aerial would work close to a transmitter. This still fixed them to one room, usually the lounge, where the

family would gather around the radio. (Figure 7)

By the mid 1930s the social effects of radio began to show. A new shape to the working week was being established. After a ten-hour day in the factory or office working men and women would go home and listen to the radio as a family pastime, especially at weekends. The purchase of a radio for the low-income families was an



Figure 7. Family listen to the radio.

economic and personal landmark. (Cain 1992: 22) The wireless now became the centre of family entertainment in the home and helped move radio into its golden years. Pictures in the home by television still had many years to go before it would take over radios place in the home as the main entertaining media.

The rise of high power transmitting stations in the country and across Europe had called for radios with greater selectivity to prevent co-channel interference. During the late 1920's and early 1930's the two-band TRF² radio was dominating the market and with the introduction of 'band-pass tuning' the TRF radio receivers had increased selectivity, reception range, sound quality and reliable reception. However most TRF radios still required a reaction control to stop them oscillating. (Hill 1993a: 63) This made radios difficult to tune needing more than one control to tune them. For better reception the Superheterodyne³ receiver was introduced it was more efficient, had no reaction control, better reception and was simple to use. The superhet was to supersede the TRF and become the dominant radio receiver design. The superhet, no longer regarded as a luxury

² TRF tuned radio frequency.

³ Superheterodyne superhet for short. The signal is changed to a lower fixed frequency and then amplified.

receiver, became reasonably priced by 1933 and the TRF became the cheaper radio for local reception. (Hill 1993a: 105) The Superhet radio with improved valves and better radio design also allowed reception of more distant stations including commercial radio from Europe.

Commercial radio for the UK market

The BBC under John Reith did not use audience research. Reith feared that reliance on audience's research would inhibit the imagination of the production staff and the interest of minority groups would be easily ignored in favour of the interest of the majority.

Those in the BBC who argued for research were aware that the BBC was not, in the mid-nineteen thirties, producing enough lighter programming to satisfy the mass public. With the popularity of commercial radio Reith lost the argument and the Listener Research Section was formed by the BBC in October 1936. (Cain 1992: 40)

With a limited number of popular programmes, in Britain, this left an opening in the market place and made it profitable for other organisations to try broadcasting popular radio for the UK. As the BBC had the monopoly for broadcasting in the United Kingdom commercial radio had to come from Europe. One of the earliest commercial radio programmes, broadcast in English, to Great Britain and come from the continent dates back to the 1920's. Captain Leonard Plugge⁴ persuaded Selfridges, in 1925, to organise a fashion show, which would be broadcast from the Eiffel Tower in Paris. (Skues 1994: 4)

With the success of the Paris broadcast, in March 1930 Captain Leonard Plugge, who was both founder and president. The International Broadcasting Company was

⁴ Captain Leonard J. Plugge was half Dutch half British and a World War 1 RAF pilot. He created the International Broadcasting Company as a commercial rival to the British Broadcasting Corporation and became Conservative MP for Colchester in 1935. (carolinesouth: 2005)

registered. The IBC started transmissions in English out of France from Radio Normandy in 1931. Although the transmitter's power was only 10 kilowatts, the signals were picked up all over the British Isles and were especially clear along the South Coast. (Skues 1994: 4) The South Coast has a large audience at which to target advertising. Many other stations also came under the IBC banner in the 1930s transmitting English broadcasts from Europe. The IBC quickly established itself as a facilities house, offering sophisticated studios for hire, and introduced the lighter American model of Radio to the UK listeners.

In addition in 1930 a French company was formed to transmit programmes from Luxembourg. It started broadcasting, in English, on long wave in June 1933. In Europe Radio Luxembourg was probably the most famous commercial radio station. Radio Luxembourg and Radio Normandy were the most successful of the continental stations broadcasting in English to the UK before World War II. They provided lighter entertainment in the lively American style, with advertisements for consumer items like stockings and cigarettes. The commercial stations claimed they had up to 80% of the audience on a dull BBC evening. (Cain 1992: 40)

The BBC made little comment on the continental stations until Radio Normandy signals were picked up in London. When news that Radio Luxembourg was going to open in 1933 with a 200 kilowatt transmitter the BBC complained to the Post Office and also wrote to the Luxembourg government complaining that it infringed the Washington Convention as it was too powerful and would interfere with British aircraft navigation systems. The station continued to broadcast against the BBC's wishes, however it did change its frequency in 1934 but not the power of the transmitter. The Post Office

refused permission for the use of landlines to be used for the recording of sponsored 'live' shows. The programmes had to be pre-recorded in London and then shipped out to Luxembourg. (Skues 1994: 5) A survey at the end of 1935 showed how popular Radio Luxembourg and Normandy were with one in two people interviewed listening regularly to Radio Luxembourg. This survey showed a call for commercial radio. (Skues 1994: 7) However as a consequence of strong representation to the French government by the British Foreign Office about sponsored programmes the French government said they would be banning English broadcasting from French radio stations in 1938. This left only Radio Luxembourg with English broadcast from Europe. The Foreign Office renewed a similar representation. However, the out break of the Second World War came first with Radio Luxembourg closing in September 1939.

The start of Television

By the end of the 1920s radio was established as a sound only media. Experiments were taking place to send images by radio and this later developed into its own medium of television. The Baird Company transmitted 30-line Television from 1929, and on August 22nd 1932 the BBC inaugurated the world's first public television service using the 30-line Baird system. This service eventually closed down on Sept 11th 1935. Technical advances had made possible a much improved TV service using 405 lines and this was started in 1936. This was the first high-definition television service in the world. The original 30-line service could show close-up pictures of faces in reasonable detail, but wider or long-distance shots had a low entertainment value. This was the era of the television experimenter, as a 30-line television receiver could be built with the minimum of apparatus and there was considerable satisfaction in receiving any sort of picture.

"Seeing by wireless" was an incredible new experience, and reception was possible over a huge area of Western Europe. (nbty 2003)

On November 2nd 1936 the BBC's regular high-definition television service officially started. The range of the television service was within 35-miles of the Alexandra Palace transmitter. (earlytelevision. 2003) At first the service alternated on a weekly basis, between the Baird's 240-line mechanical- electronic system and the Marconi-EMI's 405-line all-electronic system. The programmes were broadcast daily, Monday to Saturday between 15.00-16.00 and 21.00-22.00. The dual television transmissions stopped in February 1937 when the Bairds system was dropped, its 240-line system was not as good as EMI's 405 electronic system. (Wikipedia 2004)

The high-definition television service developed rapidly with a wide variety of programmes and a impressive number of outside broadcasts e.g. King Georges VI's Coronation procession (May 12, 1937), Tennis from Wimbledon (June 1937), and the FA Cup final (April 30, 1938) (www. earlytelevision. 2003) The first televisions were expensive, with a dual standard Baird with a 12"x 9" picture [14"tv] costing 85 Gns (£89-25p). (tvhistory. 2004) (Figure 8) This was about half the price of a small car. Sales of television receivers were slow at first, with only 2121 sets sold by the end of December 1937. With an increased interest in television sales soon



Figure 8. Baird T5 dual standard Television.

picked up and by August 1939, 18,999 televisions had been sold. (Burns 1986: 464) A small television, with a picture of 7½" x 6" [9" TV], could now be bought for about £33-00, (Burns 1986: 469/470)

The BBC and Television

The BBC had already established its radio service on non-commercial lines and believed that the same principles should be applied to television, which was regarded by the BBC to be an extension of radio. The same logic worked in the United States, but their radio was paid for by advertisers. (When 1985: 184) With a lack of studio space and to improve the quality of the programmes The Radio Manufacturers' Association suggested that the BBC could expand its service by making more use of its outside broadcast transmissions and merge some of the sound and vision programmes. The BBC did experiment with television broadcasts of mixed broadcasting with its first programme on the sound and television wavelengths towards the end of March 1938. (Burns 1986: 462) Television was limited to the London area and was not an immediate threat to national radio. Initially, the station's range was officially a 25-mile (40 km) radius of the Alexandra Palace transmitter in practice, however, transmissions could be picked up a good deal further away, and on one occasion in 1938 were picked up by engineers at RCA in New York, who were experimenting with a British television set. (wikipedia online May 2010) There were plans to expand television to the regions but television had to close down for the war on 1st September 1939, two days before war broke out, for defence reasons because it was feared that the transmitter could be used as a navigational aid for enemy aircraft (earlytelevision. 2003)

War and Post War 1939 to 1960

The changes made to radio during the war helped the development of radio for the future. In 1939 the BBC made changes ready for war with a single combined programme, the Home Service, to replace regional and national programmes. The national long wave transmitter closed with only the medium wave being used. It was a move to prevent enemy planes using the transmitters as navigation beacons. (Hill 1993a: 158) The new home service was not very popular when it started and many people wrote in to complain saying that it seemed to be dominated by organ recitals and public announcements. However the Home Service soon improved with increased output of variety shows during the war. It was shows such as, It's That Man Again (ITMA) heard each week and the war correspondents, with War Report, heard each night after the main evening news, that would eventually attract up to 16 million listeners. (BBC 2001)

It soon became clear that separate programming was needed so a new programme for the Armed Forces was introduced. This experimental programme was set up to entertain and keep up the spirits of the British Expeditionary Force in northern France. The service quickly developed into a 12 hour a day medium-wave operation, the Forces Programme. The station with its uniform output of light entertainment soon became popular with the home audience as well as the servicemen and was to achieve important lessons for the BBC when the war ended. (Cain 1992: 45)

Winston Churchill became Prime Minister in 1940 and his speeches were to rally the British people. This demonstrated the power of the wireless as a means of mass communication. But the war brought a shortage of radio receivers as the radio manufactures moved over to production for the Armed Forces. With many radio service men on active service plus a shortage of spares, it could take up to 3 months wait for a battery and with 125,000 radio sets held up in the factories, many old radios were pressed into service. To help address the shortage of radios the government imported some radios and valves from America. (Hill 1993a: 158/162) In 1943 the Government initiated a plan for a simple batteries and mains model receiver of standard design for all manufactures to produce. (Figure 9) The 'Wartime Civilian Set' was designed by Dr G D Reynolds of Murphy Radio Ltd and was released in June 1944. Despite its basic nature, with only medium wave reception, simple cabinet and dial, it was eagerly snapped up by the public with over 175,000 of the mains sets sold in the first year. (The Valve Page: 2004)

With the end of the war the BBC gave priority to sound broadcasting and opened the new Light programme. The combination of light music, comedy, light drama and regular news summaries became immediately popular. The popularity of the forces programmes made it obvious not to return to the old format of programmes that were broadcast before the war. With the opening of the Third Programme and Home Service the BBC now had three services that became its backbone until 1967. For more popular listening Radio



Figure 9. Mains 'Wartime Civilian Set'

Luxemburg also restarted its English commercial broadcast to Great Britain on July 1st 1946.

During the war and in the early 1950s, radio was very popular and was going through its golden age, but television, which restarted in 1946, and was still thought of as 'radio with added vision' by many in the BBC, started to take over as the medium of choice.



Figure 10. Small mains radio by Alba.

1950's that helped make it a mass medium was the coronation of 1953, when over 56% of the population watched, far outnumbering the radio listeners. The second was the introduction of a commercial television channel in 1955. (Crisell 1996: 25/26)

One of the new type of radio receivers to emerge soon after the war was known as the 'second set'. These were small compact radios made for a kitchen or bedroom, supplementing, the main radio in the home. (Figure 10) The small size of these radios was a direct result of the miniaturisation of circuitry, in particular, the all-glass miniature valves, developed in the United States during the war. (Hill 1993: 23)

Radio went into a long decline and between 1949 and 1958. The BBC's average evening radio audience dropped from nearly 9 million to less than 3.5 million. However the introduction in 1955 of VHF FM⁵ radio and the introduction of the first pocket transistor radio were to revolutionize the way radio was to be used. At first VHF FM radio was to provide the radio listener with less interference and better quality sound but the future role for VHF FM was to reintroduce low-power local radio. (Crisell 1996: 27-29) In

Figure 11. Regency TR-1 pocket radio.

October 1954, the regency TR-1 packet transistor⁶ radio was introduced in the USA this was the first transistor mass-market device. (Figure 11) The TR-1 came, in bright colourful plastic cases, used four transistors and was powered by a 22-volt hearing-aid battery. Priced at \$49.95, \$350 today, it was not cheap but it sold about 100,000 units in its first year. (msnbc 2004) The first UK transistor radios came to the market in 1956, the Pam Model 710, (Figure 12) at £31.10s.1d this was an expensive investment. However with mass production, and prices beginning to fall, by the end of the decade public interest in the transistor radio was growing fast. The transistor portable radio market boosted sales especially in the summer months. A few pocket-sized radios were starting to come from the Far East, and this soon became a flood in the 1960's. (Hill 1993: 26-27)

Radio Changing

In the 1960's The teenagers, the young between childhood and adulthood which starts around the age of 12 years, could now listen to pop radio from pirate radio stations on cheap portable radios. Radio was now on the move on to the



Figure 12. Pan Model 710.

beach and in the car. With the end of pirate radio the BBC changed its programmes to radio 1,2,3,4 and by the end of the 1960s introduced local radio. In 1966 the BBC introduced regular FM services in stereo on the Third Programme and eventually to the other main networks. (Hill 1993: 31) This improvement in the radio sound brought it up

⁵ VHF, very high frequency. FM, Frequency modulated. F.M. was invented by Edwin Armstrong in 1932 to solve the problem of noise and interference that AM has.

⁶ The first transistor was developed by John Bardeen and Walter Brattain working at Bell Telephone Laboratories in America in December 1947.

to the standard of the modern records. With the introduction of commercial radio in 1973 the BBC lost its monopoly of radio broadcasting. There were now more radio stations to listen to, also there were many new products, from the Music Centre to the Walkman, to listen to radio and recorded music. The new listener came along who would now dip into a programme and listen while doing something else.

Introduced in 1979 the Sony's Walkman, a cassette player with stereo headphones, was an unexpected success. The player was small enough to carry around on the move and was a social phenomenon which gave rise to extensive critical opinion. With the personal stereo people could move around and be connected to their music without being socially intrusive. Before the walkman the portable radios and cassette players disrupted the public place by forcing one's sound on others. Personal stereos enabled the listener to remain cocooned in their own world. (Creeber and Martin 2010.103) Many walkman players also had radio added to them giving personal portable radio listening on the move. Since the advent of the cassette walkman there have been a number of different mobile players, including players using CD's, but these did not have the impact that the original tape based players had. It was the arrival of the portable DAPs (digital audio player) in 1998 that a new type player became popular.

The early DAPs had limited storage space which was stored on an external flash drive however by the end of the 1990s the DAP players were capable of storing music on internal hard drives and this was the beginning of their ability to store large amounts of music files. In 2001 the iPod was launched which was to become the DAP market leader. As well as the DAP the PMP (personal media player) has been introduced. The PMP as well as playing music is a personal video player, which can also include radio and

television reception, although many iPods now contain a radio and video player. (Creeber and Martin 2010.106) Video has not been popular on the move a balance between sound and video would be a slide show that can be glanced on the move. This would give extra information to music and sound a service which digital radio can deliver.



Today the radio listener has more stations to choose from than ever and there are now more platforms, to obtain radio from, for example satellite, cable, television, and the Internet. With more radio stations now and narrow casting, to target the minority listener; you now have more chance of finding a station of your choice. The quality of Internet radio has improved making it popular to use while surfing the Internet and the introduction of internet radio receivers that are independent of the computer has widened the use of radio from the internet. Radio from Sky Satellite and Free-View television has been more popular than expected.

New for the 1990's was the introduction of terrestrial Digital Audio Broadcasting,⁷ which the BBC started broadcasting in 1995, with receivers coming in the shops in 1997. Experiments were carried out transmitting video and slide shows using the DAB system. Also Digital Radio Mondiale founded in 1998, started test transmission of digital radio in the lower wave bands also included experiments with graphics and pictures. Receiver sales were slow at first with limited stations, poor supply of receivers, model range and prices high making early take up of DAB slow. When the first high volume sub £100-00

⁷ DAB digital radio using a multiplex transmitting in the old band three-television frequencies.

[£99-99] DAB receivers arrived (Figure 13) in July 2002, with strong promotion, by the BBC of DAB, interest in digital radio increased. By the end of 2004 there were a good number of digital radio stations with many only on a digital platform plus a better range of DAB radios to choose from with prices dropping, with many radios now below £50-00. By 2008 17.8% of all listening is to a digital platform, (DRDB 2008) and more than 6.4 million DAB sets have been bought since the DAB platform launched also the platform accounted for 10.8% of all radio listening. (Broadcast 23 May 2008: 20)

Figure 13. Pure Evoke 1 DAB radio.

Conclusion

This chapter has shown that picture radio was thought of as being a useful addition to radio even in the early days of radio broadcasting where experiments with the addition pictures to radio was carried out. Baird's early experiments with small low resolution moving images, which he managed to fit in to the existing radio bandwidth, were partially successful. Baird's moving pictures had limited appeal with its 30 line pictures limited to close ups of people. The Faltograph added printed still images to radio, but was expensive and came at a time of economic decline with the broadcasters investing in television moving images instead. Consequently the Faltograph did not get the backing of television but the technology did fit into the radio bandwidth and produced better still images than a Baird's Televisor. Over the years there was a steady change to radio as it competed with other media including the technology improvements helping to keep up with social changes in media use.

Experiments of adding video, slide shows plus graphics to the digital radio systems started with the introduction of digital radio and a limited slide show service has been

introduced. Now with the introduction of digital radio the listener has a radio system with the addition of extra information on its display including, station name, slide show, running text and an electric programme guide.

The next chapter will look at terrestrial digital radio and will mainly embrace Digital Audio Broadcasting (DAB) as this is a mature system. This was the first practical modern digital radio system for a mass market. This chapter will explain some of the issues in the technical specification of digital radio, as this will show some of the differences between analogue and digital radio plus what data and sound the new medium can deliver. Today with the introduction of digital radio, there is now the means available to make a change to radio with the inclusion of text, pictures, and graphics plus surround sound.

Chapter Two

Introduction to Digital Radio

Introduction

Chapter two is an introduction to terrestrial digital radio and will mainly embrace Digital Audio Broadcasting (DAB) as this is a mature system and was the first practical modern digital radio system for a mass market. This chapter will also include other digital radio platforms and formats along with the history of DAB. In addition, to considering the differences between digital and AM radio, this chapter will explain some of the issues in the technical specification of terrestrial radio. This will show some of the differences between analogue and digital radio plus what data and sound the new digital medium can deliver. Today with the introduction of digital radio, there is now the means available to make a change to radio with the inclusion of text, pictures, and graphics and surround sound. When an analogue radio band changes to digital, more information can be transmitted within the same waveband space. This is most attractive to broadcasters as they can now offer more stations within their allotted broadcast space. (Grotticelli 2001) This chapter will also give a general background to many different digital radio formats and how they work before investigating DRM, digital radio for the lower broadcast bands, in chapter three.

Why digital, the difference between AM / FM

DAB is different from traditional AM and FM analogue radio, the DAB system is fairly complex in terms of computational requirements and is a broadband transmission system, transmitting several audio programmes and data channels over the same frequency. The transport of the information, audio and data also employs new concepts

like audio compression where the audio information for digital radio is reduced in size. (Hoeg 2003: 265) Compression of the digital information has made it possible for the audio signals to be transmitted over channels of limited capacity. For example a Compact Disk's format of 16-bit PCM¹ has a bit rate of 706 kbit/s per monophonic channel, which is much too high to be transmitted over the airwaves without compression. The bit rate has to be reduced, to about 100 kbit/s per monophonic channel, for radio transmission. With an efficient compression system the quality of the sound should have no perceptible difference between the original uncompressed sounds. (Hoeg 2003: 75/76) Coding techniques for high-quality audio signals use the fact that the ear has limited frequency response and is an imperfect organ. The coding removes sounds that we cannot hear and perceive. (Hoeg 2003: 78) For the listener good compression of the sound allows the sound to appear as near as possible to the original recording before the compression was applied. Also the compression allows for efficient use of the radio spectrum and more choice of radio stations.

At a time of rapid change for the media and communications industries, radio must continue to evolve to ensure that it is as relevant tomorrow as it is today. The medium must meet the expectations of emerging generations of audiences accustomed to increased choice over their media consumption. Alongside the challenges, the digital transition offers a unique opportunity for the radio industry to transform its relationship with its audiences. DAB digital radio is a robust broadcast technology that is effective in mobile, portable or static environments, capable of cheap, mass production and of

¹ Pulse-code modulation (PMC) is a digital representation of an analogy signal where the magnitude of the signal is sampled regularly at uniform intervals, then quantized to a series of symbols in a numeric code. (Wikipedia 2009)

interaction into a variety of devices. DAB replicates radio's analogue strengths while extending them through digital technology. (BBC. DCMS 2004: 1)

Radio broadcasting is one of the most widespread electronic mass media with hundreds of programme providers, thousands of transmitters and billions of receivers worldwide. The market has been widely covered by the AM and FM audio broadcasting services since the early 1920s. Today we live in a world of digital communication systems and services. Essential parts of the production processes inside radio houses have been changed to digital ones, starting with the change from conventional analogue audiotape to digital recording on magnetic tape or hard disk, with digital signal processing in mixing desks and digital transmission links in the distribution processes. Also there are other digital storage media in the music market such as digital tape and disk formats (CD, Mini Disk or DVD), plus there are digital streaming and download systems for the Internet. As a result broadcast transmission systems have changed from conventional analogue transmission to digital. (Hoeg 2003: 2) The next phase is to convert the transmission of radio and receivers in the home to a digital format. DAB radio and SKY satellite started the early widespread change to digital reception of radio. Early in the development of DAB millions of people had the opportunity to receive many different DAB services from some European countries and many others including, Canada, Singapore, Taiwan and Australia which launched operational or pilot services. Other countries like China and India had begun experimental services. (World DAB Forum 2001) With the change to digital broadcasting systems there is the infrastructure there to develop extra services including picture radio.

Historically radio has been trying to improve the sound quality and stop interference with radio reception. Analogue radio transmission consists of transmitting the actual audio signal modulated onto the RF carrier. Digital radio systems such as DAB and radio delivered via digital satellite addresses the disadvantages that hamper the analogue systems by transmitting digital waveforms on the carrier to the receiver. These waveforms are then decoded, in the receiver, to a binary format to make up the digital information that carries the audio information. This process is less prone to interference and makes digital radio systems go a long way towards stopping interference helping to give better quality sound.

Today, radio in the UK enjoys excellent health. Nine out of 10 adults tune in every week. From small beginnings over 80 years ago, radio in the UK has come to occupy a central place on the media landscape, delivering social, cultural, democratic and economic value to its citizens. The medium has thrived in the analogue world, with growth in the number of stations fuelling innovation throughout radio, from station formats to production techniques, which has served to retain and refresh radio's audience appeal over the years. However, for radio to maintain its position of strength during a period of unprecedented technological change, it must continue to evolve. The next step in radio's evolution must be for it to take advantage of digital conversion or risk being marginalized. The radio industry is ripe for this change, not least because it has no room to grow in analogue. (BBC DCMS Review 2005)

Digital Audio Broadcasting (DAB)

The first digital broadcasting system giving audio resembling CD quality was developed for satellite delivery in the early 1980s. These were broadcast in the 10 to 12 GHz

satellite broadcasting bands. The systems used little sound data compression and it was not aimed at mobile reception. This satellite system could not serve a great majority of listeners, such as those travelling in cars and could not deliver local services a well established feature of FM radio. (Wiley 2003: 5) Also with the introduction of the digital broadcasting system NICAM 728 (Near Instantaneously Compounded Audio Multiplex), developed by the BBC for stereo television sound in the VHF/UHF bands, (Hoeg 2003: 2) proved that terrestrial digital transmission was practicable. Therefore terrestrial digital sound broadcasting was considered as an essential delivery method for reaching all listeners. (Hoeg 2003: 5)

In Germany the Federal Ministry for Research and Technology (BMFT) set in motion a research initiative to assess the feasibility of terrestrial digital sound broadcasting using more effective methods of sound compression and more efficient use of the radio spectrum. A study completed in 1984 indicated that promising results could be expected. As wide international agreement would be the only way to start a new digital sound broadcasting system, BMFT set the task for its Project Management Agency at DLR (German Aerospace Centre) to form a European consortium of industry, broadcasters, network providers, research centres and academics for the development of the new digital audio broadcasting system. Towards the end of 1986 a consortium of 19 organisations from France, Germany, the Netherlands and the United Kingdom signed a co-operation agreement and applied for notification as a Eureka project. (Hoeg 2003: 5) Eureka is a pan-European network for market-oriented, industrial research and development. It was created as an intergovernmental initiative in 1985 to enhance European competitiveness by its support to businesses, research centres and universities who carry out pan-European projects to develop innovative products, processes and

services. (EUREKA 2005) In December 1986 the project, now call Digital Audio Broadcasting (DAB), was notified as the Eureka 147 project and was given national research grants by Eureka. National research grants were awarded to the Eureka 147 projects in France, Germany and the Netherlands. However due to the granting procedures official work on the project could not start before the beginning of 1988. (Hoeg 2003: 5)

Between 1988 and 1995 DAB technology was established. Then the UK government allocated spectrum space and licensed commercial multiplexes ready for the BBC to start test transmissions in 1995, on one of the first DAB transmitter networks, with the commercial network starting four years later in 1999. The BBC at first transmitted its five national networks on DAB and in 2001 the BBC had approval to start five digital only radio services, which started in 2002 (BBC DCMS: 2004: 8/9)

The first DAB transmissions in the United Kingdom by the BBC in 1995 used experimental receivers to test the system, with the first commercial receivers, coming on the market in 1997. DAB had in the beginning been aimed at the hi-fi enthusiast plus the car radio user, with improved traffic information and reception compared with an FM radio. A look at the early BBC coverage map (Figure 14) shows that the early coverage was along the M1, M4 and M5 motorways. (BBC online) See appendix 1 for larger map picture.

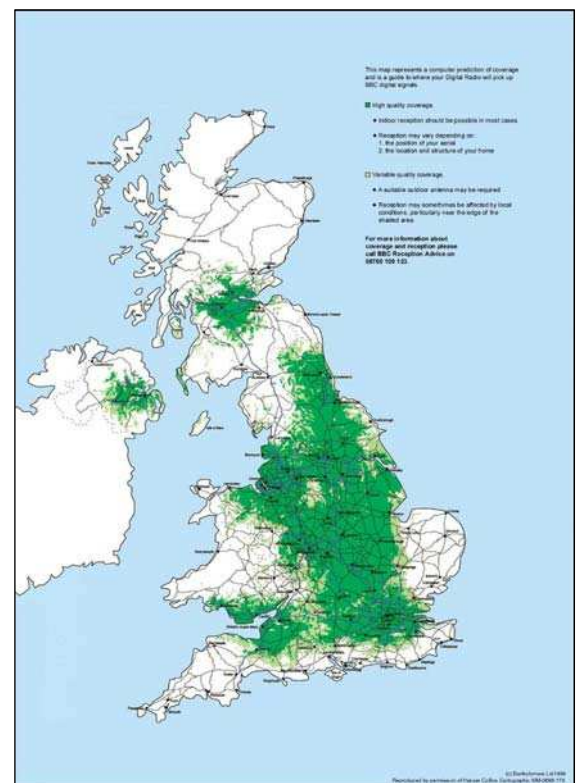


Figure 14 BBC early DAB coverage.

Digital radio is a whole new world for interference free, crystal clear listening, a huge choice of stations, and the end of re-tuning in the car, data at home as well as on the move. (BBC information 2001) DAB, is broadcast on terrestrial networks with reception through new digital radios with a non-direction antenna. listeners can obtain CD-like quality radio programmes even in the car. Furthermore, DAB can offer text, pictures, data and even videos on the radio. (World DAB Forum 2001) That is how the early advertising for digital radio was produced promoting the audio quality of the new medium with only limited information putting forward the new content that could be available with digital radio. Later on the BBC started advertising its new digital only services and the emphasis went away from the possibility of CD quality, which the DAB radio system could transmit, however as the BBC's chosen bit rate was below CD quality, to fit more stations in its multiplex, CD quality could not be delivered. The BBC and commercial advertising campaigns on radio and television helped make the public aware of DAB radio.

Multiplexes

In the UK, the Government has allocated seven multiplexes, between 217.5 – 230.0 MHz parts of the old band three-television spectrum, for terrestrial DAB. These multiplexes are used by the BBC, independent national and local radio stations. Each multiplex carries a mixture of stereo and mono broadcasts with data services; the number of stations and services that will fit into a multiplex is dependent on the quality required. Some stations are analogue simulcast but there are also new digital only stations. Just over 1 Mbps of data is available in a multiplex for audio information. The BBC, using a bit rate of 124 kbps and less, has incorporated 11 stations in its multiplex. Most stereo

DAB radio stations, in the United Kingdom, use a bit rate of 124 kbps, which is below the minimum for good quality sound reproduction using MP2 audio codec. DAB's MP2 audio codec was designed to be used at a higher bit rate such as 192 kbps to 256 kbps; these bit rates are virtually always used for television audio channels, which also use MPG2 compression and has better sound reproduction than DAB radio. (digtailradiotech 2005)

Compression

As there is a limit to the amount of data that can be transmitted, to fit in the available bandwidth, compression has to be used. Compression helps make it possible for several radio stations to be fitted into a multiplex with a good quality sound if done correctly.

DAB uses MPG Layer 2, or MP2 for short, it is also known as MUSICAM a compression system to reduce the amount of digital information to be broadcast and COFDM, (Coded Orthogonal Frequency Division Multiplex) to ensure that the signals are reliable and robust. These two digital technologies are brought together to produce a reliable and efficient radio broadcast system. To reduce the amount of digital information to be broadcast MP2 is used to compress the system and reduces the vast amount of digital information required to be broadcast. (Smartradio 2004) MP2 will discard sounds that will not be perceived by the listener. Just removing the very high and low sound we cannot hear does not bring down the size of the audio package enough so very clever psycho acoustic modelling has to be done to 'fool' the human ear into ignoring the bits that are left out and generally the compression works. The major problem with digital compression is that you always lose something in the process. (The Radio Magazine 2005: 22) Problems arise when using a too low bit rate or multi-encoding. A reduced bit

rate, below 192 kbps with MP2, means that the codec cannot process the information efficiently and distortion is introduced. Also a heavily compressed music file cannot be reworked many times before the quality is severely impaired. The lower bit rate can give a lower quality audio experience than a good FM radio station's sound. In the past when a new radio system was introduced the quality of the broadcast improved. DAB needs something to set it apart from traditional radio, as the sound quality is often lower than traditional FM radio, the introduction of digital extras, text, graphics and images could give DAB an advantage over FM radio.

Coded Orthogonal Frequency Division Multiplexing (COFDM)

This is a technique where radio frequencies are processed to carry the digitised audio signal transmitted to the receivers. COFDM splits the MUSICAM signal into 1,536 different carrier frequencies, using a precise mathematical relationship. This process ensures that even if some of the carrier frequencies are affected by interference the receiver is able to recover the original sound. COFDM will also stop multi-path reception; this is where the radio receives extra-reflected signals, which upsets AM and FM reception. This means that a national radio station can use the same frequency across the country; which is a more efficient use of the radio spectrum; also no re-tuning is needed when you are travelling from town to town. This is ideal for reception in the car where frequent retuning has to be done although RDS² will retune the FM stations on a suitably-equipped radio. For picture radio, as there is less interference to the signal, COFDM will allow quality reception of images and sound.

² Radio data service, a digital signal added to FM for extra information.

Since the summer of 1998, commercial DAB receivers have been on sale in the UK. Sales of digital receivers were slow in the early day of DAB, although companies such as Arcam, Sony and Technic had receivers for sale. Their cost was high at first (about £500-00 each) although Videologic produced and launched a digital DAB tuner for £300-00. The industry observers believe that receivers needed to break the £100-00 price barrier to reach mass-market acceptance. (Centaur 2001) With the development of a cheap DAB module by Texas Instruments and RadioScape, this costs the set makers about £30-00, enabled DAB radios to be sold at less than £100-00. All the set maker had to supply was the case, dials and speakers (Television September 2001). The first high –volume sub £100-00 [£99-99] DAB receivers were introduced in July 2002, with strong promotion of DAB, interest in digital radio increased. By the end of 2004 there were a good number of digital radio stations, with many digital only, plus a good range of DAB radios to choose from with prices dropping and many radios now below £50-00. Car radio take up was slow with about 3,000 sets sold in 2004. DAB radio sales for February and March 2005 were 53% of portable radios with audio systems second at 19% set top boxes and in car was last with only 2% share of sales. (BBC 2005) The most popular place to listen to the radio is in the home, over two thirds of listening 70%, followed by 16% listening in the car and 12% at work. (Ofcom: 2005) The most popular type of DAB radio sold up to 2005 was the kitchen portable. These small conservative designed radios give a pleasing background sound with their small speakers masking the poor quality of some digital broadcasts. The top selling radio by mid 2005 was the EVOKE-1 range of kitchen radios. A development of the original EVOKE-1 the EVOKE-1^{XT} Tri-Band (Figure 15) has enhanced features for international users, including: Band III



Figure 15. Evoke 1^{XT}

and L band DAB reception; FM with RDS and support for a wide selection of European languages. Also they have added an alarm for bedroom use and a timer for use in the kitchen. (Pure Digital 2005) The prices of DAB radios are still higher than the equivalent FM/AM radios around £20-00 for the cheapest basic DAB radios. The supermarkets are selling FM/AM radios with a CD player for under £15-00, although some manufactures are adding extra features to DAB receivers, i.e. digital recording, pause and rewind plus electric programme guide, to make DAB the radio more attractive at a high price. This could go against one of the early selling points the simple and ease of use of the early DAB radios something radio has tried to do and market over the years. The take up of the in car market has been slow with only a limited selection of receivers on sale with the car radio sets at around £300 being expensive and difficult to install. This is something that has to be addressed to expand this important radio sector. The French government has passed a law requiring all consumer devices and cars to be fitted with digital receivers by 2013. It is hoped the move will provide an incentive for European car manufactures to consider fitting digital receivers as standard in all new models. (The Radio Magazine 2009: 4)

Digital Audio Broadcasting Plus (DAB+)

To overcome some of the shortcomings of the first DAB system DAB+ has been introduced. DAB+ uses an improved coda, HE AAC / AAC³, which allows DAB to carry between 3 and 4.3 times as many radio stations in a multiplex. HE AAC only needs 64 kbps for good audio quality. MP2 needs 192 kps, for good audio quality, but most UK DAB station only use MP2 at 128kbs with some using a lower bit rate. (digitailradiotec

³ HE AAC (High-Efficiency Advanced Audio Coding) MPEG 4 aacPlus.

2005). DAB+ will lower the cost of transmitting DAB as more stations can be fitted into a single multiplex. DAB has been allotted the old band three television spectrum. As this is in the higher VHF band the coverage of each transmitter is limited. DAB signal's also have to reach an indoor portable radio with its own rod aerial attached. To get national converge it is expensive to run many transmitters that are needed to get to all listeners.

The development of ACC began in 1994, and was standardised in 1997. (digitailradiotec 2005) It was not until late 2006 that MPEG-4 aacPlus was adopted by Worlddab as the new audio coda for DAB. (medianetwork 2006) DAB+ software was not completed until the end of 2007. (digitailradiotec 2007). The first radio with DAB+ arrived in the shops in 2008. With the introduction of DAB+ more countries have shown an interest in starting a DAB radio system. Malta launched one of the first DAB+ networks in October 2008 and Australia followed in May 2009.

Other Digital Radio Systems

The USA has chosen another digital broadcast system for terrestrial digital radio IOBC (In Band On Channel). It is being marketed as HD Radio. The system, based on IOBC technology, has been developed to transmit digital signals along side and on the same frequency bands used for analogue AM and FM radio. (Worlddab 2004) The IOBC is to be used to duplicate the analogue transmission offering extra services and better quality sound. The IOBC signal, besides having CD quality on FM can give the AM stations better quality sound and text data displays. IOBC signals can also be sent to cell telephones and other portable digital devices. The cost for a radio station to upgrade will be relatively small. In the USA they have chosen not to open up any more spectrum

space for new radio stations, as has been made with DAB, for it would mean more competition in a highly competitive market place. (The Radio Magazine: 2004: 15)

For digital radio in the AM bands below 30 MHz, the long, medium and short wave bands, the DRM⁴ radio consortium was formed in 1998 to create a universal digital system for the AM broadcast bands. Their system can have near FM quality mono sound on the AM bands using the current narrow bandwidths. It also is able to deliver text, RDS, graphics and pictures. It will be a substantial improvement over existing AM radio and be a bigger difference in quality than DAB is over FM radio. As the format is similar to DAB, the production of a module for receivers to support DAB, DRM, FM-RDS and AM/FM was developed for the sale of multi standard digital radios for the end of 2005. This RadioScape module allowed the production of lower priced multi-band receivers able to receive DAB and DRM digital broadcasts. DRM will be explained in more detail in chapter three.

Visual information with radio

In the early days of DAB, radio experiments for the addition of text and pictures to enhance radio were made. These trials were made to assess the value of the additional information to listeners and to prove that it was technically possible to broadcast plus receive visual programmes over the DAB system. Many organizations have looked into adding extra data to DAB with a major demonstration of video using DAB in 2003 by Radioscape at the NAB show (National Association of Broadcasters) in Las Vegas, USA. This was a joint demonstration with Microsoft, NTL Broadcast and Tandberg

⁴ Digital Radio Mondiale.

Television. The broadcast video content from CNN International, encoded in Windows Media 9 and DAB audio content from Capital Radio Group was multiplexed using RadioScape Digital Radio Infrastructure products. This was up linked via satellite from the UK and then rebroadcast locally via DAB. Using only 150Kbite per second, impressive full motion streamed video was then received on a personal computer using RadioScape's software-based DAB receiver card. The demonstration also included portable applications with streaming video to a PDA sized screen using only 64K Bits per second. Data over DAB on the move was also demonstrated using an HP Compaq IPAQ PDA with an Etheractive DAB data card sleeve. RadioScape anticipated that the initial demand would be in the Asia Pacific region where the culture of listening to radio is less established but video is very popular. (worldadab: 2003)

Visionradio working with ntl broadcast a ten-minute cartoon and a thirty-minute music programme over ntl's test DAB multiplex in Cambridge in 2004. The cartoon 'There's No "F" In Computers' was a cartoon book converted to a voiceover narrative supported by a slideshow illustration. The music programme used the concept of enhancing music with video and other appropriate information. (visionradio: 2004)

Further tests of the DAB Slide Show were carried out in 2008. A simple slide show was demonstrated in London in February using some of the commercial radio stations also BBC radio 5 used the Slide Show for the Olympics. These trials used an iRiver hand held video player to display the slide show as there were no conventional DAB radios with a suitable display.

The BBC used a DMB slide show to enable a range of high quality images to be delivered alongside the radio stations audio. For this trial the BBC broadcast content based around Steve Wright's Radio Two afternoon programme The Broadcast Website service used DAB to deliver pages of interactive content to digital radio sets, with content for the trial including news, weather and sport. (Worlddrb 2007)

The BBC's radiolabs produced an internet visual radio trial in January 2009 with text, graphics and video. The radiolabs team thought the trial was a success and it served to teach them where they could improve visual radio in the future. They found that the times where the trial came together was where the production teams in the studio were really engaging with the technology they had been given, using the console to supplement their broadcast, but not to the detriment of the normal radio listeners. The Switch show on Sunday 18th January ((Figure 16) was thought to be the best example of this, with creative uses of graphs and text messages, with very strong links to the live studio events, and innovative use of the video feed. Although radiolabs felt that sometimes the trial occasionally lacked a sense of pace, for great chunks of time nothing apart from



Figure 16 BBC radio-labs demo.

the video was active in the console. A finding has emerged from their subsequent focus groups that the longer these feeds remained static and stale, the more danger there was for the users to simply ignore them. The production teams needed to never let the studio console stand still and to always show something. The radiolabs team thought that they

could look into having more intelligent default states; to never let the console stand still and to always show something, without needing any manual studio intervention. (BBC Radiolabs 2009)

For the visual radio trial a different audio stream was used that was less compressed.

Heavily compressed audio tends to have a very 'flat' or 'upfront' dynamic range and there is no perspective with the audio. This heavily compressed audio is also the 'sound' of Radio One which meant that the normal studio sound doesn't 'sit' with a video track. (BBC Radiolabs 2009)

Overall these experiments have proved it is technically possible to add images to radio and send images over the digital radio networks, is now up to the radio broadcasters to make the most use of the visual radio systems for enhanced radio programmes.

Digital Multimedia Broadcasting (DMB)

By 2005 DAB video developed into Terrestrial Digital Multimedia Broadcasting (T-DMB) an extension of DAB this enables the delivery of television, video, digital quality audio and other data services to mobile devices. (Smart Radio 2004) The new standard was proposed by South Korea and is compatible with DAB. (Worlddab 2004) The main changes from DAB are the use of more efficient MPEG-4 encoding technologies to deliver the media content. DMB is designed to broadcast in parallel with existing DAB services, both audio and data, and can be easily integrated into a DAB infrastructure.

By 2005 tests of DMB were made and some DMB enabled devices were launched. The first T-DMB receiver launched by Perstel (Figure 17) has a 5" screen and is made for

vehicle use. As DMB has a more efficient coda, MPG 4, some counties are evaluating the system for radio use instead of DAB to get more stations into a multiplex. Singapore is using DMB for an interactive point-of information and advertisement system for public vehicles. South Korea awarded 6 licenses to content providers to begin regular commercial audio, video and data services by the end of 2005.



Figure 17. Perstel DMB receiver.

Sonarics Labs announced in March 2005 complete DAB solutions on a single, general-purpose low cost DSP. The new Clear-Signal version, offered integrated software capable of displaying a photo album and DAB MOT slide shows on a colour liquid crystal display. (sonarics 2005) This is important to radio as the software will be able to decode a slide show on a digital radio fitted with a suitable display. Broadcasters can enrich the audio content of programmes, advertisements and advertising messages with visual images and consumers can use it to display jpg photographs they have recorded onto a memory card.

Mobile telephone

In January 2004 Nokia announced 'Visual Radio' to be included in their new range of multi-media mobile phones. It is easy to get the service with the push of a 'Vision Radio' marked button on the new visual radio enabled handsets. 'Visual Radio' is not a complete digital service as Nokia uses the F.M. radios built into their phones for the

radio sound and a synchronized interactive visual channel delivered over the GPRS mobile network. The F.M radio is the normal terrestrial broadcast, this has no charge. The visual content is paid for as it comes over the telephone network. Nokia handsets have only FM radio but the system could be used with other broadcast systems. FM and AM radio is a good choice, for mobile phones as it makes less demand on the batteries than if it was equipped with a digital radio system, battery usage has to be kept low in a mobile telephone. The service is not television based the delivery is text and pictures. (Figure 18) shows an example of a visual radio display. Visual radio services started in early 2005 with Kiss FM in Finland and later in the year Perfect 10 (98.7) FM) in Singapore. (visualradio: 2005)

Visual Radio enabled mobile phone systems will allow users to view the title and artist of a song playing on the radio, check upcoming concerts dates, purchase ring tones, plus other content from the artist also participate in the radio station promotions. For the radio station operators, Visual Radio can increase listener loyalty and advertising revenue. For the mobile carriers, Visual Radio provides an opportunity to increase data services usage and revenue, as well as average use per user. (visualradio: 2005)



Figure 18. Nokia Visual radio

Other platforms.

There are other ways to listen to digital radio broadcasting as many of the terrestrial stations, digital and analogue, are also transmitted on satellite, digital television, cable and the Internet. The Internet and satellite however are less flexible than terrestrial broadcasting, they are often fee paying, and have their limitations for mobile use.

Satellite radio, being broadcast on such a high radio band and low power, needs an aerial pointing at the satellite with a good line of sight to get a signal. This is impractical for use in a car as buildings and overhead road signs will stop the signals and this will give brief dropouts unless there are many local fill in transmitters. The main satellite radio receivers in the UK are set top boxes that receive Sky television satellite channels. The radio is played through the television with some text on the screen. Most of the many terrestrial digital radio stations are transmitted on Sky along with many more stations. When tuned in the television screen displays a blue screen, with some text, that shows the station, time and a few lines about the programme. (Figure 19) In addition, there may be one line showing the artist currently playing. Not all the Satellite radio channels are free-to-air.

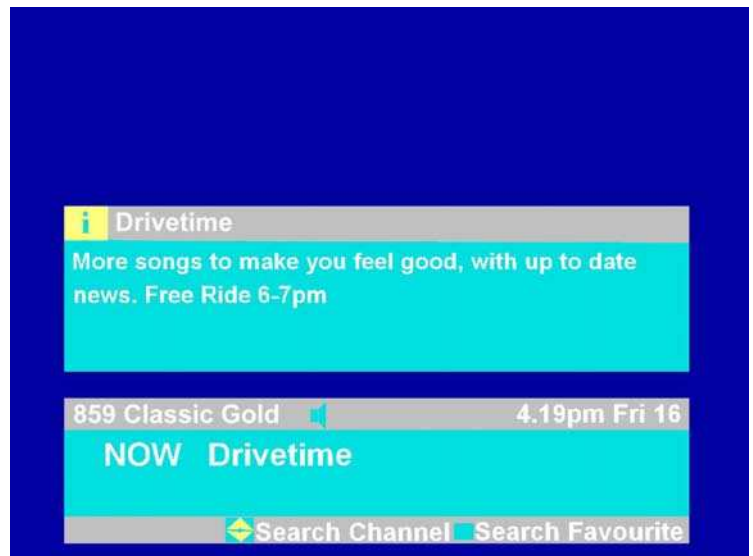


Figure 19 SKY television radio page

For example 'Saints Day', named after Southampton football club, are encrypted and can only be received with view cards with addresses in the south.

(Television 2001: 611-2). With the number of channels available via satellite, there is room for many minority stations. To make a Sky satellite receiver more flexible Sky introduced, in late 2005, the Gnome. The Gnome (Figure 20) was an battery powered portable receiver that allows Sky owners to listen to the stereo television sound around the home. With a range of 100 feet the Gnome could control the



Figure 20. SKY Gnome.

satellite receiver and there was also full control of the volume plus you can preset 10 favourite channels. Sky has about 80 different radio stations, which includes nearly all the DAB radio stations. (Media Week 2005) The Gnome introduction price of £69-99 plus posting was a bit high when you could buy a DAB radio for less than £50-00 in 2005. The Gnome only lasted two years before Sky stopped selling it. Sky announced that they were giving up the Gnome so they could focus on more up to date products. It also had some tuning problems with the radio channels when Sky updated its electronic programme guide, the radio moved to four digit numbers which the gnome could not store. (Medianetwork [on-line] February 2006)

In the USA where there is plenty of open country and a satellite is high in the sky along with few obstructions a radio satellite system has been introduced. This satellite radio service started in 1997 by Sirius and XM satellite who obtained licences to broadcast a multi-channel digital signal direct to customer receivers. The system lets XM Satellite and Sirius to transmit without interruption across the United States and southern Canada. XM has 150 and Sirius 120 of fee-paying channels with commercial-free music on many stations. (detnews: 2005) In July 2008 Sirius Radio purchased XM satellite leaving just one US satellite radio service. (medianetwork [on-line] 2008)

A radio satellite service that could be received in the UK is WorldSpace Corporation, a pioneer in direct satellite to receiver audio who launched their first satellite in October 1999, the AfriStar satellite covering Africa, the Middle East, and Mediterranean Basin transmitting digital audio broadcasting direct to the radio. (WorldSpace 2001) Although it is not intended to serve Europe, reception is possible in the UK. (Television June 2001). The company by 2005 had two satellites and could cover Asia, Western Europe

and Africa, covering more than 75% of the world's population. The service has had a poor start with only 64,000 subscribers by June 2005. WorldSpace's early promotion was poor and it chose to launch its first service with a satellite over Africa where the radios at \$60 were too expensive for the market place. WorldSpace has now shifted its focus to the Indian market where there are about 200 million radio listeners and a growing middle class. India is now a major target for many lifestyle products. To improve reception WorldSpace is to build a network of terrestrial repeater stations in India, France and Italy. (signonsandiego: 2005) Satellite radio has not been very successful business as World Space went into liquidation in November 2008.

(Medianetwork 2008)

Digital radio is also available from Freeview digital terrestrial television introduced in October 2002. The use of the radio from television has been more popular than many thought. Freeview has all of the BBC's digital radio stations and some commercial radio services. Freeview, besides introducing analogue viewers to digital television, has also targeted its set top boxes at satellite television owners as a second television box. This will allow digital television and radio to be used in other parts of the home.

Internet radio

Internet radio quality has improved over the years with better compression and online radio players. Having a return link, the telephone connection, an Internet radio can have extras such as using the return path for buying goods, and contacting the radio station. The internet is a cheap broadcast medium as there is no transmitter network to run and the coverage is world wide. Some of the radio players have images with the sound WCBS-FM 1011 and its sister stations use a slide show plus advertising videos between

songs. When a song is playing, a picture of the album that the song comes from or the station's logo is shown.

With the introduction of wireless broadband (Wi Fi) radio receivers, which connect direct to the internet modem without the use of a computer, now on sale from £75-00, also have an DAB and FM tuners. Interest in internet radio around the home is becoming popular with good sales in 2008. Wi Fi internet radios makes listening to internet radio easy and is popular with those who like to listen to radio with traditional equipment. The radios are connected to a website that have a database of 10,000 plus radio stations from around the world. (digitalradiotech 2008) The U.K. government wants every one to be able to get access to a basic Internet broadband (guardian on-line 2009) therefore Internet radio coverage would be nation wide. Internet radio is also available on a mobile telephone which also can be connected to a suitably equipped car radio.

The Listener

Today the listener has many radio platforms to choose from often confusing them. A new receiver, with many offering extra features not found on the standard FM / AM radios, has to be brought for reception of the new digital radio services. Some of the extras are digital recording, text display, electronic programme guide, programme pauses, and MP3 downloading to a suitable unit. Digital radio has given the opportunity for more stations and the possibility of a better choice of radio programmes. DAB in the UK has not given the listener better quality sound than FM, there is less interference which can help the sound quality, but it does give access to extra stations and is more portable than digital radio from television and the Internet. It has given spectrum space for some AM medium

wave stations to use a digital platform and to be received with better quality reception plus better sound quality i.e. BBC Radio 5 and Capital Gold.

Conclusion

Since the early days of radio many developments have improved the quality of the sound and reception of radio but by 2009 the DAB system has given the space for extra radio stations and some extra digital information. DAB is not such a big leap in sound quality as was FM radio when it was introduced in the 1950s. DAB has less interference than analogue radio but by using a low bit rate for the MPG2 compression the quality possible with digital radio has not been not fully exploited. The low bit rate is used to fit the maximum number of stations into a multiplex which is expensive to operate especially for national coverage. The main attraction for the listener is an easy to use radio with a text display with some extra information and a number of extra stations. There is more of a choice of radio programmes from the new stations available only on digital radio plus an improvement in the sound quality for some of the AM stations using the digital platforms. DAB in its current format has little room for improvement a move to DAB+ with MPG4 compression would make it more spectrum efficient but the changes to the specification would not work on most DAB radio already in use. Many broadcasters are looking into using more efficient digital radio systems including an updated DAB+ and DRM who have developed digital radio to replace AM radio, which has poor sound and reception with interference. DAB+ has started a new interest in terrestrial digital radio with Australia starting DAB+ broadcast in 2009. Australian digital radio would be launching with anything up to 30 channels per multiplex and extensive use of the new visual aspect of radio.

The French Government have a new 2009 law requiring consumer devices and motor cars to be fitted with digital radio receivers. The radio receivers, with the exception of cars, will have a multimedia display and all radio will be digital by 2013. (DRDB 2009) This is a boost to digital radio and multimedia displays can be used for picture radio.

There have been many tests of images and video with the DAB system but no one is putting out a full service. As the broadcasters have not used DAB to improve the sound quality over FM radio DAB needs something to set it apart from existing analogue radio. This is something that picture radio would do.

With the introduction of a new display by Frontier Silicon, a leading supplier of DAB radio solutions has developed a unique touch screen, with a full colour audio visual system, that would allow the display of digital radio slide shows. (frontier-silicon 2009) The manufactures now have the technology to produce radios for a picture radio service.

Developing countries that would like to go digital may find DAB too expensive to implement. DRM have developed a digital radio system to improve the broadcasting quality of AM to near FM mono which can cover large distances with a single transmitter. The DRM system will be the subject of chapter three.

Chapter Three

Digital Radio Mondiale

Introduction

DAB uses only a small part of the radio broadcast spectrum, part of the old VHF television band. Radio broadcasting also makes use of the long, medium, and short wave bands. Even with AM's limited bandwidth it is possible to introduce digital radio which could include pictures. Therefore chapter three will examine the history and progress of DRM, Digital Radio Mondiale, a consortium that has developed a digital radio system for the lower radio bands below 30 MHz also DRM+ for FM band II and the lower TV bands. DRM was formally founded at a meeting in Guangzhou in China on March 5th 1998, as the world's only non-proprietary digital system for digital radio in the lower radio bands below 30 MHz, the long, medium and short wave bands. The DRM system can use existing frequencies and bandwidth around the world. It can offer good quality sound plus text, data and improved reception compared to AM radio. With the upper broadcast band congested DRM has a system that can revitalize the lower broadcast bands with better quality broadcasting sound and extra information.

Also this chapter will investigate a number of issues around what is possible within the limited bandwidth of an AM digital transmission and the issues that could confront broadcasters who are going to or could use digital AM. AM radio has changed little since the start of broadcasting in the 1920s and today the medium wave transmissions are seen to be of very low quality, not giving the sound quality and services that other broadcast systems provide in the 21st Century. (New Electronics 2005: 14) Digital technology can improve the quality of AM radio with better sound quality and reception also the addition of extra services that are similar to those broadcast with DAB.

Since the start of radio broadcasting radio engineers have been trying to improve the quality of radio transmissions and radio receivers. Digital radio gives the radio engineers a new tool to improve the reception and sound quality of radio. For example digital radio gives more efficient use of the air waves, a clear signal with less interference and the possibility of better quality sound as good as the best recordings such as a CD. Digital systems also give the opportunity to add extras to the transmissions such as text, and images. It is up to the broadcasters to make the best use of the engineer's improvements.

As we saw in chapter two DAB¹ (Digital Audio Broadcasting) in the UK has used digital radio to make more efficient use of the air waves with broadcasts with less interference, added text information, and slide shows. DAB has not been used to improve the sound quality over FM², the best quality analogue radio transmission in current use. Although with the introduction of the improved DAB+ with a more efficient compression system, there is the opportunity of better spectrum use plus the radio quality could be improved to sound better than FM and closer to a quality CD recording.

The frequency range below 30 MHz the short, medium and long waves offer the possibility of very large coverage with only a single high power transmitter. These frequencies are the easiest and often offer the only practical way to cover large countries with low technical infrastructure. AM is an old system which provides limited audio quality and is finding acceptance only in regions where no other service is available. There is an obvious need for a more advanced system working in this and other AM

¹ A digital radio system based on the standard developed by the Eureka 147 (q.v.) consortium and adopted in the UK and many other parts of the world primarily for the delivery of audio and data services (q.v.) to fixed, portable and mobile receivers. (BBC. DCMS October 2004:37)

² FM: frequency modulation radio broadcast in the band II frequencies between the old band I and band III television spectrum.

broadcasting frequency. This gave rise to a consortium called Digital Radio Mondiale (DRM) to develop a world wide standard for such a system. (Hoeg 2003: 22/23)

DRM, is managed by a consortium of over 90 members worldwide, which includes broadcasters, broadcasting associations, network operators, manufacturers, and others. (Digital Radio Mondiale. 2009) DRM is an open standard (ETSI³ – ES201980) this allows easy access to the use of DRM which is optimised to deliver good quality digital radio in the frequency bands below 30MHz, i.e. HF⁴, long wave and medium wave. DRM can offer good audio quality and extra digital information at the low bit rates of between 11 kbits/s⁵ and 24 kbits/s in the limited bandwidth available below 30MHz. This can be accommodated within the low overall capacity available within channels in these bands using a modern efficient compression system MPEG-4 AAC, (advanced audio coding) which is the core audio element of the MPEG-4 encoding system also with Spectral Band Replication. Spectral Band Replication is a technique that enables the bit rate transmitted to be further reduced by not sending the higher frequencies within the audio signal; the higher frequencies, such as a triangle in an orchestral piece are effectively regenerated by processing in the receiver based on the lower frequency information, which is transmitted along with some additional information to aid the process. (BBC. DCMS October 2004: 47/48) Using a digital system with MPEG-4 will allow DRM to improve the quality of radio reception and as with DAB allow the addition of other radio services to be transmitted.

³ ETSI.(European Telecommunications Standards Institute)

⁴ High frequency. Also known as short wave, this is a band of frequencies below 30 MHz, which have good long distance propagation characteristics and are used for international broadcasting, in particular.

⁵ Kilobits per second

AM's decline

Broadcasting developed around the world in the early part of the twentieth century and the number of broadcasters and listeners grew rapidly so that today there are at least two billion radios capable of receiving broadcasts in one or more of the AM bands. With the development of the transistor and then the integrated circuit the real cost of these radios has dropped massively since the early days. At the same time portability has increased with radio receivers reduced in size and weight whilst lower power consumption has reduced the operating cost, since batteries need replacing less frequently. The rapid growth of broadcasting in the AM bands meant that most regions of the world today have access to at least some basic radio services. In many cases these services are received not only from within the listener's country but from countries outside, providing access to a broad range of programmes whether delivered via the LW, MW or SW bands.

(Broadcast Manual 2004: 8) The lower AM bands are an important part of the radio broadcasting spectrum and in many countries it would cost too much to use the VHF band with its limited coverage. The AM bands would be a cost efficient way of running a digital radio service with the minimum number of transmitters keeping the cost low.

Although the AM market still remains very significant, in terms of number of broadcasters and hours of broadcasting, it is also clear that AM is in gradual decline. Other radio broadcasting delivery systems, such as FM, DAB, Internet and satellite, have attracted listeners away from the AM bands, as the other services can provide superior sound quality. Nevertheless the AM bands still provide an attractive and cost-effective way for the broadcaster to reach a large audience. Broadcasters have made large investments in AM transmission equipment, which in many cases has many years of useful life remaining. In particular the antennae and transmitters used for high-powered AM services, which represent a significant investment, which offer the possibility of

modification to allow digital transmission, presents an attractive proposition. Although many broadcasters will find it possible to modify their transmission equipment to provide digital, as well as analogue services, this will take time to complete and some transmission equipment, which is unsuitable for modification, will have to be replaced. Ideally DRM would like the replacement transmission equipment to have a digital capability and be incorporated as part of the normal equipment replacement life cycle. Over this migration period both analogue and digital broadcasts will co-exist. This means that new AM radios will need to provide both analogue and digital reception well into the future. Thus the digital reception facility will be in addition to, rather than instead of, analogue reception. (Broadcast Manual 2004: 8) For picture radio, in the lower bands, there has to be some investment in new info structure but not as big as DAB in the VHF bands and digital radio could refresh the use of the lower radio bands.

To improve the use of AM radio reception and its use on digital radio receivers 'AMSS', (AM Signalling System) has been developed by the BBC in collaboration with other sectors of the broadcast industry. AMSS is a new signaling system developed under the auspices of DRM and is being broadcast by the BBC World Service. AMSS allows new digital receivers to identify the broadcast when tuned to AM and put the station label on the tuning menu, as if it were digital. In addition, the system supports alternative frequency signaling, so that a station equipped with AMSS can change the listener's receiver automatically to a digital, AM or FM simulcast, as appropriate. (Digital Radio Mondiale. 2006) AMSS will keep AM radio a useful addition to a digital radio receiver with easy access and station identity on the display.

Digital Radio Mondiale

AM broadcasting in the medium and short waves has changed little since the first broadcast stations were set up in the 1920s. Today AM transmissions are seen to be of very low quality, not offering the sound quality and facilities that are expected for the 21st Century. With the low quality of AM and a decline in listener numbers, broadcasters acknowledged a need for change. As a result, an informal meeting was held between a large number of international broadcasters and broadcast equipment manufacturers in Paris in September 1996 it was during this meeting that the basic idea for DRM was born. (New Electronics 2005: 14/15)

A couple of months latter, a further meeting was held with a wider group of interested parties, including national and international terrestrial AM broadcasters, transmitter and receiver manufactures academics, plus research centres. It was agreed that a group should to be established whose task would be to define the structure for a formal organization to be called Digital Radio Mondiale (DRM). The organization would be made up from all interested parties, including broadcasters, communications systems developers, research institutes, and the electronic manufacturing sectors. Its objectives were to formulate a new system to replace the antiquated AM system. (New Electronics 2005: 14/15)

The DRM (Digital Radio Mondiale) consortium was formally formed in 1998 with the aim of formulating the requirements and design of AM digital radio as well as introducing a digital broadcasting system suitable for use in the AM broadcasting bands. The founding Members of the consortium strongly believed that the unique properties of these broadcasting bands could be better exploited using the latest technology and that their popularity would be sustained by the introduction of such a digital transmission

system. It was felt that a well designed digital system could significantly improve reception quality, reliability and ease of use and ensure the continued use of the AM bands. To meet these aims a highly flexible system has been developed. This has led to its successful inclusion in a recommendation for use by the ITU⁶ (International Telecommunications Union) and to its standardisation within the IEC⁷ (International Electrotechnical Committee) and ETSI⁸. (European Telecommunications Standards Institute) (Broadcast Manual 2004: 2) With approval of these originations DRM could proceed to the next stage and had an international standard which can be used world wide.

The primary application when it was proposed was for DRM to be used for international broadcasting in the HF (short wave) band as the long distance transmission characteristics of this band have been used by broadcasters for many years. The BBC is contributing to its development because of the benefit it could bring to the World Service. The analogue services are highly prone to distortion, fading and poor audio quality, however the DRM system addresses many of the limitations of the short wave bands by offering better audio quality with ease of tuning and automatic selection of the desired content whichever channel is being used for its delivery at any given time. (BBC. DCMS October 2004: 47/48)

As with DAB, DRM uses COFDM modulation. (Coded orthogonal frequency division multiplexing). This is a technique used in digital radio and television terrestrial broadcasting which conveys the data to be transmitted on a large number of closely

⁶ ITU is an international organization within the United Nations System where governments and the private sector coordinate global telecom network and services. (www.itu.int/home/ 2006)

⁷ IEC promotes international co-operation on all questions of electrotechnical standardisation and other related matters. (www.iec.ch/index.html 2006)

⁸ ETSI plays a major role in developing a wide range of standards and other technical documentation as Europe's contribution to Information and Communication Technologies (ICT) standardization. (www.etsi.org 2006)

spaced carriers, rather than one, as in analogue broadcasting. It improves reception in environments where analogue signals can be disrupted by reflections of the signal affecting the quality of the broadcast signal itself. Using COFDM enables a single frequency network (SFN) to be used. This is where many transmitters are broadcasting on the same frequency to cover a large area and with COFDM it does not matter if the individual transmitters overlap. This is not possible with analogue transmissions as in areas that receive signals from transmitters broadcasting on the same frequency there is considerable joint interference. For SFN to work each transmitter must be broadcasting the same data, on the same frequency at the same time. A broadcast with SFN needs only one frequency for national coverage of a single radio station where as AM needs more frequencies for the same coverage, this makes digital radio very spectrum efficient for national coverage. (Digital Radio Mondiale. 2005)

It was clear, from the start of the DRM system development, that any replacement digital system must provide audio quality that can compete with FM as listeners often agree that they enjoy listening to the programme content carried by AM radio stations although they find that the technical quality is just too poor to retain their loyalty in the longer term. This is particularly true of SW listening, where the additional need to choose the correct frequency, depending on time of day and season, adds a further deterrent factor. (Broadcast Manual 2004: 9) DRM has many of the features of DAB, from which it was developed. There is a text display with the station name and extra information as with DAB. There is no video facility, as the low bit rate would only allow a small picture with a very low frame rate. The first evaluations of the new system took place through 1999, with field tests in 2000 and pilot broadcasts taking place in 2002. Scheduled DRM broadcasting was launched in 2003. (New Electronics 2005: 14/18) The decision to start regular DRM digital transmissions was taken in April 2003 in Geneva with Deutsche

Welle, the world's first broadcaster to sign up. Transmissions on short wave started on June 16th 2003 with many DRM members taking part. These included Deutsche Welle, Radio Netherlands, Radio France International, Radio Sweden, Deutsche Telekom (T-Systems). (dutchsche-welle 2005) It was important that the broadcasting members started the transmissions to get the DRM system into the public domain so it could help the rapid progress of DRM.

One of the main differences between DRM and DAB is that DAB is a multiplex oriented system, with audio using Mpeg1 Layer 2 coding, in which data for several stations are grouped into a wide multiplex, which can contain around seven good quality music stations. DRM is a low bit rate system, with a more efficient coding than DAB and is used on AM which analogue signal produces lower quality music than DAB. DRM can use several coding schemes at different rates to offer optimum quality with different programme content. This can make it possible for a DRM radio station to broadcast in two languages simultaneously. DRM like DAB also allows data to be broadcast and may contain up to four audio or data components. (New Electronics 2005: 38/39) With more than one audio or data channel a broadcaster can cover multi language transmission or use a single frequency for two separate radio services.

Digital Radio Mondiale Plus (DRM+)

In March 2005 the DRM Consortium voted to extend its system to operate on the broadcast bands of up to 120 MHz. This includes the lower VHF television bands and the FM broadcast frequencies in VHF band II, 87.5 to 108 MHz. The utilization of the lower television and FM bands will allow the employment of a wider bandwidth and therefore a higher bit rate can be used than on AM allowing the transmission of high quality sound when one station is being transmitted, or the use of a small multiplex to

broadcast in two languages or more simultaneously depending on the quality required. The wider bandwidth that the VHF bands give will allow more data to be sent with the broadcasts allowing quality text and images with little loss in sound quality.

The move brings DRM+ into direct competition with the more established Eureka-147 DAB system. Although DRM with its different transmission system can be complementary to DAB digital radio filling in gaps that a DAB system cannot cover, as DAB is more suited to a quality national network and other wide-area broadcasting system. On the other hand DAB can be somewhat inflexible and expensive for individual services with specific targeted or small-scale coverage requirements. In a large DAB multiplex system, all the broadcasters have to share the transmission facilities and costs plus all the stations have equal coverage areas. FM broadcasts and AM are on a single frequency not multiplexed so the stations can be more independent than a station sharing a multiplex. This could allow an independent broadcaster more flexibility in the area it covers and the content it gives plus space to experiment with extra data, text, images etc with its transmissions. This is one of the reasons the Eureka-147 technology was rejected by U.S. radio in favour of IBOC. (rwonline 2005) IBOC (In-Band-On-Channel) is another form of digital transmission for narrow band AM and wide band FM applications. Unlike DRM, IBOC produces both an analogue and digital component so that the same broadcasts can be received by conventional and digital receivers. (aoruk 2004)

Soon after the announcement of DRM+ many broadcasters took an interest in the system. An example of one of the possible uses of DRM+ was the Australia government's announcement that once band 1 analogue television has been closed down, the future use of this spectrum (45-50, 56-70 MHz) would be reserved for digital radio broadcasting

transmissions using DRM+. The Australian government has taken this decision to allow wider coverage by digital radio across the wider areas of the outback whilst adopting Band 3 DAB+ for the cities and highly populated regions. They further comment that DAB will never achieve the regional coverage that analogue radio reaches and that DRM will enable widespread digital coverage. (Television 2006: 234) By June 2006 the Australian Communications and Media Authority (ACMA) has allocated the 1386KHz medium wave frequency in the Woollongong area for DRM test to run until early October 2006. (Television 2006: 499) With Australia committed to DRM test other countries will be able to use their experience to evaluate DRM for their use.

DRM multimedia

DRM can deliver data with the sound broadcast as with DAB. However with the narrow bandwidth on AM there is a lower bit-rate for the data than DAB.

With its wider bandwidth DAB has allowed video experiments, which developed into DMB, mobile television. Successful tests of images (figure 21) were carried out, for example received in



Figure 21. DRM test image.

October 2004 from VT Merlin

using a 1kw transmitter, was a test

data broadcast web site for SW web data. The test web site showed how weather and weather satellite images could be broadcast on SW using a DRM multimedia player.

Using the DRM system colour images were broadcast at high data rates and downloaded onto a computer terminal. (owdjim 2005) Also DRM PAD Programme Associated Data

(PAD) can also be transmitted, for example, Fraunhofer's NewsService Journaline[®] data service. This has an 11 bit unique code so the DRM receiving software knows how to decode and display the data stream. The structure of the Journaline pages, including the logo and menu selection structure are defined within the Fraunhofer Multimedia Player as the page is displayed immediately whilst waiting for the news text or broadcast web site to be received. This player is part of the Fraunhofer DRM decoder software. This PAD service has a data rate of approximately 800 bps (bits per second). (drmradio 2004)

These experiments proved that the DRM system could carry images and text. As DRM has less room for large data files, on AM than DAB, it will not be able to run as a television service but will allow the use of still images, graphics and text if a broadcaster wishes to enhance its radio broadcasts.

DRM multimedia services can be signalled in two ways. PAD (Programme Associated Data) and data only (Non-PAD). PAD is the multimedia application that is tightly linked to an audio programme. It is only decoded when the associated audio service is currently selected. When the listener selects this audio service, the PAD multimedia application is automatically started. (VT Merlin 2006) Data only (Non-PAD) is a multimedia application that is independent of any audio programme; it is presented to the user as a stand-alone DRM service and can be individually selected. (Figure 22) shows an example of BBC World Service broadcast from Rampisham, UK on 7320 kHz - Data Service 1 transmitted at 1.9kbps. (VT Merlin 2006) This demonstrates the flexibility of



Figure 22 BBC World Service pictures from Rampisham test transmission.

the DRM system where data can be programme related or transmitted as a separate service.

Market Situation

The AM broadcasting bands have unique propagation advantages not available in other parts of the spectrum. In the LW band wide area coverage can be achieved from a single transmitter with very stable and reliable propagation characteristics. In the MW band both local regional and international coverage can be obtained depending on the transmitter power and time of day. The SW bands provide very wide area coverage at long distances from the transmitter. In all cases reception can be achieved using small low cost portable or mobile receivers providing virtually universal coverage. The transmission technology required to deliver these services is well established, reliable and has a long lifetime and in addition, as transmitters are terrestrially based they are easy to service, should faults develop. (Broadcast Manual 2004: 8)

The broadcast industry worldwide is rapidly moving towards a time when all broadcasting will be delivered to listeners and viewers using digital platforms. The replacement for FM is seen in systems such as DAB whilst television is increasingly using DVB (Digital Video Broadcasting) in one form or another. CDs, DVDs, PCs and the Internet are becoming the preferred delivery and storage mechanism for consumers who wish to retain material for multiple replays. The progressive adoption of these technologies by consumers could leave AM radio isolated as one of the few ways in which audio material continues to be delivered in an analogue format. The employment of digital technology in these other media has provided the opportunity to raise the quality and reliability of the sound or video delivered. Without the development of a digital AM system it is likely that the present slow decline in listeners will lead to

progressively less use of these bands. Some of the reasons why broadcasters felt it was worth developing a digital system, for the AM bands in order to assure the continued future of broadcasting in these bands. (Broadcast Manual 2004: 8)

In June 2003 the start of regular DRM transmissions commenced with many members of the world-wide DRM members taking part including Deutsche Welle, Radio Netherlands, Radio France International, and Radio Sweden. However as with the start of DAB affordable radios receivers are needed to be in the market place to get a large audience to receive the DRM broadcasts. The first mass market radios compatible with DRM's technology were going to be on the market by the end of 2005. This was delayed until mid 2006, as the development of the radios had taken longer than anticipated to reach the market place. DRM needs good quality radio receivers, at affordable prices, and programmes with new content to make customers buy DRM capable equipment.

In early 2009 All India Radio (AIR) took the decision to take up digital radio using DRM on the medium and short waves. Also The Russian General Radio Frequency Centre on the 20 January 2009 took the decision to use DRM in the medium and short wave bands. These two countries with a combined population of more than 1.5 billion people should provide a large enough market for manufactures to finally commit to large-scale production of DRM receivers. (Medianetwork 2009) DRM has put the technology in place it is now up to the set makers and broadcasters to use the system and bring it to the public's attention.

Conclusion

The introduction of DRM services has allowed broadcasters to provide listeners with a significant advance in audio quality and service reliability together with the means of

enhancing the listener experience with easier tuning and added data. International broadcasters are now able to provide services on SW and MW, which for the first time will compare favourably with local FM services and DAB radio, whilst national and local LW and MW broadcasters will also benefit from the enhanced audio quality and the ability to provide simultaneous data services. (Broadcast Manual 2004: 5) Also DRM+ will allow an economical upgrade of FM to a quality digital service.

DRM could be used for education in developing countries, as it can send data to computers, where local infrastructure is poor or expensive. Three transmitters can cover many countries which can be independent easy to run and look after and would be cheaper than a satellite system. It is important for DRM to expand into new markets to stop it becoming a minority broadcast system. The decision of Russia and India to use DRM could be the start of digital radio in the lower radio bands being used by many other countries.

To be assessed in a later chapter is the question of whether new content is needed to get more listeners to use digital radio something DRM may need. DAB's growth was helped with good promotion and that some radio stations were digital only, which helped to make DAB popular with some listeners. The addition of better text, graphics and images could help to foster more interest. But for this to happen there is a need for innovative programming and better displays on digital radios.

Chapter four will now consider how radio sound is perceived by the listener to provide an insight into the use of images with radio.

Chapter Four

Picture in the mind

Having looked at the history, in chapter one, of radio which included many of the technical improvements which has helped radio survive including the adding of pictures and text in its early years. Then in chapters two and three some of the improvements today and possibilities of digital radio transmission were explored. We can now move on to the use of pictures with radio. To make the most of digital radio, broadcasters will have to have an understanding of how images, pictures, graphics, text plus video works so they can make the best use of it with radio.

With the introduction of digital radio there is now the means for images to be used live with radio broadcasts. The images can now be sent over the air to a radio that has a suitable picture display, and to the many other platforms that we can now get radio from. Most of the platforms have receivers with screens capable of displaying pictures; the Internet, mobile phones and radio on television are some examples. On most of these platforms it is expected to see images with the content. When adding images to radio there is a need to understand what type of images to add, the timing, size, colour, and is it going to add something to the programme or distract the listener, are some of the things to consider. The radio programme producers need to know that adding images to radio has to take into account that radio is a sound media and that the extra information should be used carefully. Also they need to know something about adding pictures so that radio is kept different from other media, not reinvent television.

Therefore, this chapter will consider how radio sound is perceived by the listener and will explore approaches to how we perceive sound and vision. This will provide insights into the size and type of images to use with picture radio. Also, this chapter will give an understanding of radio sound and the relationship between sound and vision, and investigate its use in radio, television, film and writing.

Radio has developed its own language over the years and uses codes to make sense of the sounds coming from the radio. We receive sounds then make pictures in the mind but to recognize many of the sound we need codes or to use other senses to know what a sound is in order to understand it. In radio, a single sense medium, extra words are used to make many of the sounds work.

In film and television images are used, so less verbal clues are needed, could images help and add to the radio experience? Radio has only verbal clues plus sound effects as well as music to inform and entertain the listener. Film, as well as television, consists of sound, plus images to get its message across and the printed word often has images to guide the reader. Therefore, radio is unusual in not using images in its broadcasts and could use a limited picture and graphic service to add more information to its service.

Sign posting

The imagination is used in all media but radio is a blind medium with no visual clues compared to film, television and the illustrated text. It is also live, in the sense that you could not reread it as you can with printed text. It is more like cinema and theatre but with less information. TV and film also cannot be reread unless you replay a tape or

DVD. To make sense radio had to learn to put sign posting into its programmes to make sense of the flow of sound coming to the listeners.

Most sounds have a narrow frequency range and to recognize them we normally need clues from our other senses. It is our visual sense that we use the most to see what is creating a sound. Radio, as it is a single sense medium, has to have signposts to make sense of the sounds it makes. The sound of rustling recording tape could be the sound of a rustling ball gown, a golfer searching for a ball in the rough or of some recording tape. The accompanying words have to fix the sound for the listener. 'Damm! I don't often hit the fairway' a golfer searching for his ball in the rough. 'Darling you'll be the belle of the ball tonight' a lady in an evening gown and 'This studio's a pig-sty. Throw this old tape out' for a bunch of recording tape. (Crisell, A. 1996: 47) Not all sounds need a signpost, seagulls always suggest the sea, probably because of repeated use in radio plays and film has made them into an aural cliché. (Esslin, M. 1980) Similar signposting is also used with pictures where text is added to help make sense of the picture.

Stereotyping is often used to set a mood or scene. This can be an author's method of treating a character so that the character is immediately identified with a group. A character may be associated with a group through accent, food choices, style of dress, or any readily identifiable group characteristic. Also the sound of a strumming acoustic guitar sound can be used for a Spanish setting, a crowing sound for daybreak, an owl-hoot to show darkness and mystery. (Crisell, A. 1996) The cinema uses similar codes to radio including the owl for night to heighten the tension and a loud clock for silence. Sounds also require textual pointing by giving support from the dialogue or narrative. The ear will believe what it is led to believe. This pointing might be termed 'anchorage',

which is how Roland Barthes describes the function of words used as captions for photographs. Visual images, he argues, are polysemous and all signs are polysemic, i.e. capable of having a range of possible meanings. The range of meanings is narrowed down by the context. A photographic image is inherently polysemic. Its meaning is anchored by accompanying text. (cultstock [on-line] 2009) But so are sounds, hence words help to 'fix the floating chain of signifieds in such a way as to counter the terror of uncertain signs' (Barthes 1977: 39) (Crisell, A. 1996: 47/48)

Hot / Cool Mediums

Will the addition of pictures and illustrations reduce the sounds importance, radios main asset? According to Mc Luhan 1997 radio is a hot medium. Will images make it into a cool one? Will picture radio be a hot or cold medium and how hot or cold should the pictures be?

Radio transmission is a quality electronic medium that has allowed us to send sound over long distances without wires. Before the introduction of radio broadcasting, radio was used simply as telegraph, a low quality system, which is usually a one to one message system. According to McLuhan 1997, the simple telegraph and telephone are a cool medium as they give the ear a meagre amount of information. Speech is also a cool medium of low definition, because so little is given and so much has to be filled in by the listener. On the other hand radio broadcasting, is a hot medium and does not leave so much to be filled in or completed by the audience. Therefore a hot medium is one that allows less involvement for the receiver of information, than a cool one, also a hot medium extends a single sense in "high definition". High definition is a state of being well filled with data. (McLuhan 1997: 22)

A photograph is another hot medium, where the cartoon a low cool one, as a cartoon gives little visual information compared to a photograph. The cartoon may be a simple drawing but it can have impact and its limited visuals can give it a strong message. Speech is cool and of low definition as so much has to be filled in by the listener. When speaking direct to someone we take in the visual clues, such as body language, as well as the speech. (McLuhan, M. 1997: 22) Using radio there is direct sound to the listener therefore compared with print radio broadcasting is direct speech. With print, speech has to be transformed into code, words, and then decoded by the reader. It is quicker to read something for oneself than to listen to somebody else reading it. An average newsreader utters 160 to 180 words per minute a ten minute radio bulletin is the equivalent to only one and a half columns of news copy. (Crisell, A. 1996: 83) Moreover it is also possible to reread and scan printed text. The newspapers use this to the full with more in depth news than radio and television can give and many stories on a single page. As radio is a relatively slow medium, speech is slower than reading text, some images would speed up the delivery of information on radio as fewer words are needed to get the message across. Television and film use moving images to speed up the delivery of their information.

Therefore, according to McLuhan's hot and cold theory the use of a cool medium with radio would keep the sound the dominant medium. The use of a hot medium of colour photographs or moving images would take away some of the weight of the sound. A simple picture (Figure 23) showing fashion for 1968 would give extra

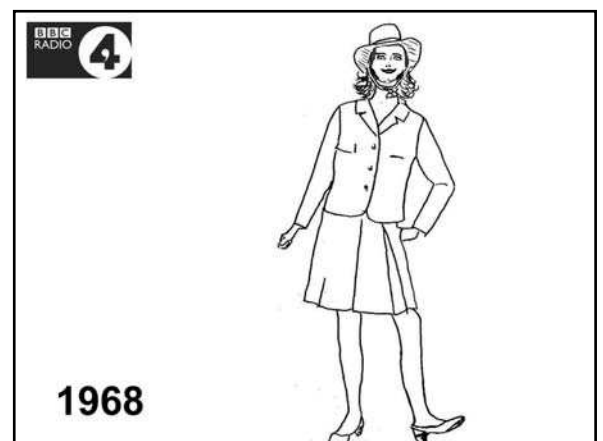


Figure 23 simple picture

information without corrupting the sound content. Also a simple black and white illustration would use less data than a full colour image or a moving image so it would fit easily into a limited data stream. The images could also be displayed on a basic low cost display therefore helping to keep down the extra cost of a picture radio receiver.

Part of the DAB radio profile for a receiver, profile 2, is an audio receiver with a colour screen of at least 320 x 240 pixels and the with the inclusion of slideshow presentation which is mandatory. (worldtab 2009) This size of radio display would also dictate the best type of image to use. As a small screen is used it would better to use it for close ups. As a great deal of radio listing is done at a distance from the receiver while doing something else. A close up image, on a small screen, would be easy to take in at a glance. Also if a low resolution is used simple line drawings and cartoons would give a clearer image to use than a photograph. Using line drawings would make radio images different from other media today and line drawings by being a cool medium would not distract the listener from the sound which makes radio distinct from other media. Line pictures may not be practical for live radio pictures because of the cost and time to produce the drawings. As this would need extra skilled staff it would be easier and cheaper to use photographs. A radio station could use clip art from a computer for general work or use a computer software programme to convert the photographs to a line drawing but these often give a poor quality image.

The photograph

The photograph is a highly efficient means of cultural communication. It has the advantages of credibility, easy mass distribution and instant convertibility into a symbol. Since visual imagery is more readily abstracted than sensations of touch, smell, sound

and taste, the mind is accustomed to using images as ideas. (V Goldberg 1991: 135) The digital photograph may be the most practical to use for picture radio as it is plentiful and easy to use. Digital photographs would be easy to pass through the station's infrastructure to the listener with little processing. Black and white would be a cooler medium to use but a fine colour image of a sunset would be hard to resist in colour by a local radio presenter. Also a digital photograph can be sent in by the listeners over the telephone to interact with a radio programme. Radio stations do have photographs posted on the internet, some sent in by the listeners, but often it is hard to find them on many complex web sites.

Digital photographs would be an easy medium to use for picture radio as it is easy to get and use. Also, digital photographs can be up to date or nearly live for news pictures. Traditional art work takes time to produce and using stock images can become stale.

Pictures in the mind

Radio creates pictures in the mind, which the listener may well believe are real and this gives radio broadcasting potency. In the early days of radio it did not take long before people listening thought what they heard was real. The ear will believe what it is led to believe. On the 16 January 1926 a talk broadcast by the BBC by Father Ronald Knox was thought as real. This satire used the public mood of the time and tapped into their fears. This was by inserting plausible spoof news reports into the talk. At first there was a report of the film star, Joy Gush, arriving in Southampton by boat, from the United States. Then the reports moved on to unrest in London. With the BBC being seen as authoritative and a public service made it all seem more believable. With simple sound effects this broadcast was the first to use artificial reality later repeated twelve years on

in the USA by Orson Wells with “War of the Worlds”. There was a warning it was a satire before the programme started but this would be missed for those coming late to the broadcast and many listeners take little notice of pre programme announcements. (BBC Radio 4. 2002) This is an example of a hot medium working and being used to its full potential. Radio is good at stimulating the emotions and does not need extra information all the time added pictures should be used only when needed. For example in 1924 the first play especially written for radio could only work well on the new blind medium. A Comedy of Danger by Richard Hughes was set in under ground a mine in total darkness. (Crisell A 1994: 157/158) This would be very hard to put over on the stage and on film, as these are largely visual media. The new radio media was not many years old but it was already starting to make the most of the capabilities of its new medium.

Radio Times gives added information

Radio is not completely blind as there are publications produced with programme guides and extra information. The BBC produced the Radio Times which was founded on the 28th September 1923 in response to a newspaper boycott of radio listings. It was, at one time, the magazine with the largest circulation in the United Kingdom. (Wikipedia 2007) The BBC also produced The Listener which was first published on 16th January 1929 to record the reproduction of broadcast talks. The Radio Times and Listener gave added information for the listener and they became popular with three million copies of the Radio Times printed each week by the mid 1930s. (Baker 2002: 23) The Listener previewed major literary and musical programmes, reviewed new books and printed a selected list of the more intellectual broadcasts for the coming week. (Wikipedia 2006) These publications gave the listeners extra information to go with the radio programmes.

For example, when the BBC started broadcasting radio in the 1920s, they did not have the knowledge of how to do a football commentary so they printed in the Radio Times a grid for the listeners to follow with the commentary. For the 80th anniversary of the first football commentary in 1927 the BBC published a grid, this could be printed from their Internet web site for a special broadcast of the January 2007 Manchester United verses Arsenal football match using the grid. (Figure 24)



Figure 24 BBC radio football grid

Today the Internet has taken over as an important information source for radio stations with most radio stations having an internet site. Some of the internet sites space is used to give extra programme information. With many radio programmes today now asking their listeners to go on-line for extra information picture radio would give this information live and if it was important for the programme why not see it live where it can give the best impact not at a later date. Included on-line there are pictures of the presenters, images sent in by the listeners, a studio web cam and news pictures to enhance a news story. Not all programmes need an image as the sound picture is more important in many radio productions. For example the voice of a presenter does not always fit their photograph and it can be better sometimes to keep the sound image for some listeners. Images given out live will give the most impact for a programme. Not everyone would see published information or have access to the internet for a programme and it can have less impact given before or after the event.

Radio programmes can give different images to each listener. They do not all interpret the words and sounds the same, therefore, for some information to be correct or more precise, extra information from an image could be used so that all the listeners have the same image and message. For example a new insect destroying farmer's crops would be better given as a colour image. This is where picture radio would be useful in giving more precise information.

Radio is not the only medium that makes extensive use of the imagination. It is every bit as active when we read a book. Reading and listening are rather similar in the sense that within the broad limits set by language both the reader and listener can – must – form a mental picture of what is being described. But whereas literature's 'pictures' are entirely an effect of language, radio's are also suggested by the sound of voices and of other phenomena, sound effects, which imply the existence of a material world we cannot find in books but can see in theatre, film and television. (Crisell, A. 1996: 9) There is an important difference between words which are written or printed on a page and words on the radio. Words on the radio are always spoken they, therefore, constitute a binary code in which the words themselves are symbols of what they represent, while the voice in which they are heard is an index of the person or 'character' who is speaking – a fact which was perceived and researched fairly early in the medium's history (Pear 1931) (Crisell, A. 1996: 43)

Interpreting the world seems to be visual. We may hear, smell or touch an object, but it is not until we have seen it that we feel we really 'know it'. (Crisell, A. 1996: 8) Hence the distinctiveness of radio is not that it involves the imagination while the other media do not, but that it involves it to a different extent. In literature everything must be imagined

since nothing can be seen except printed words, nor can anything be heard although illustration and pictures are used to help the printed word. In the visual media many things can be seen and heard and proportionately less is left to the imagination. In radio many things can be heard, and this direct intimation of the material world is perhaps why, in its drama productions at least, its verbal descriptions of a physical setting or of a person's thoughts or appearance are generally much more economical than those of literature and closer to those of theatre, film and television. (Crisell, A. 1996: 9)

Having sound and visuals, the information should be easier to assimilate as research from Manchester University study showed. When given a combination of sound and images from television, both sides of the brain are used making it easier to process and retain information. Audio and text only uses one side of the brain. (Ceefax 2002)

Conclusion

This chapter shows that using glanceable and important information only not images and text, just to fill in the display's space, would be the least distracting and important use of images for radio. Radio already has limited text, as with RDS on FM and DAB's rolling text, to take the attention away from the sound therefore, adding pictures may well dilute radio if not managed in the right way. However, as radio has limited bandwidth, pictures on radio would have to be small to be able to fit into the available bandwidth and this should keep them remote from the sound. The images could be used to help the sound as illustrations do in printed text. This would enable the sound to be the dominant influence on the listener. (Figure 25) An

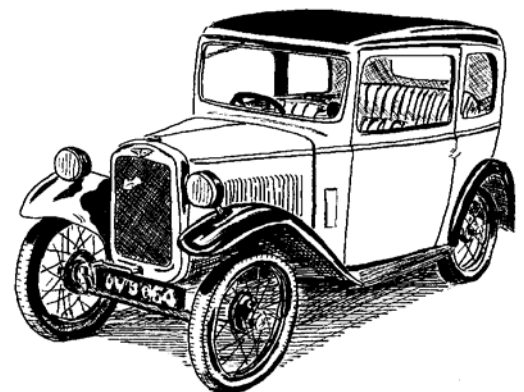


Figure 25 1932 Austin Seven

example of a line art drawing of a 1932 Austin Seven that could be used to give extra information.

With picture radio the visuals should be presented in such a way as to keep the sound as the dominant medium. Not to add so much information on the screen and give the listener visual overload otherwise picture radio would become the cool medium of television and lose its strong influence on the emotions through sound. As radio listeners are often doing something else while listening to the radio the images should be able to be taken in at a glance. This would also help keep the attention on the sound content.

Images used sparingly should help radio give extra information plus bring it into up to date as images are now a major part of modern media. Using illustrations, drawings, plus cartoons would work well but the cost of skilled staff would put off many broadcasters. They could use clip art from a computer and stock images but these would be of limited use in a live setting. This is where limited use digital black and white photographs could be used as it is a cooler image than a colour photograph and it would detract less from the sound output. Do not give the listener image overload, images, running text, and other information on the screen at the same time, with too much information will reduce the sound's importance which is radio's strong point.

Radio has learnt over the years to use the right codes to make it work. The broadcasters have an audience with 80 years of radio behind it that has been brought up with radio and has learnt the codes from an early age. Radio is a blind medium excellent for music and it is music with a friendly presenter that has become the main programming on the radio

today. The next chapter, five, will investigate the type of radio programmes that might benefit from the addition of graphic and pictures and the factors that will influence them.

Chapter Five

Where to add the images

This chapter will critically examine the issues of commercial success in radio and where pictures could help improve the radio experience as there are some things that radio is restricted to as a sound only medium. This will be considered to see whether radio can be improved with graphics and pictures. Radio is an intimate medium that can provide company, in the home, car and workplace, being a single sense blind medium; radio is excellent for stimulating the imagination and producing pictures in the mind. However sometimes sound and words alone cannot put over the information; therefore images, graphics and text could help make the message clearer. This chapter will also investigate the type of radio programmes that might benefit from the addition of graphic and pictures and the factors that will influence them.

For picture radio to be viable, so there is a demand for pictures, it would have to be added to most radio programmes in some form. This would encourage manufactures to produce enough receivers, with a suitable display, at a reasonable cost. Radio stations would need to cover the cost of a picture radio service. This is where the commercial stations could use picture radio, to add an extra dimension, to their advertising.

Therefore, for picture radio to be successful the graphics and images would have to be added and made to work on popular programmes not left to a minority radio station that few will use.

To succeed in a highly competitive marketplace where television, lifestyle magazines, newspapers, cinema, theatre, websites, DVDs and CDs jostle for the attention of a

media-conscious public, the radio producer must first understand the strength and weakness of radio and make some comparisons with other media. (McLeish 2005: 1)

Broadcasters sometimes forget that people have other things to do life is not all about listening to the radio or watching television. (McLeish 2005: 2)

When adding pictures to radio the difference between other media must be considered. Much of radio is live which gives it an edge that film and much of television does not have, even recorded radio is often treated as live, also radio is more interactive than television. The radio listener is more likely to interact with a radio programme and is encouraged to telephone, text and write to a radio station. Radio addresses each listener as an individual (Wilby, Conroy. 1994)

Television is often the main entertainment medium in the home and it is also experienced as much as a form of 'company' (an extra voice in the corner of the room) than as a medium that needs careful scrutiny. (Ellis 1982: 164-5) Television is a successor to radio, as much as cinema, theatre and music hall. The sense of many television programmes can be gathered by listening to the sound-track, while washing up or otherwise occupied, with only an occasional glance at the screen. (Holland 2000: 79) In this situation the moving images are not important. The television is being used as picture radio, therefore still images can give the same information to the informal viewer.

Radio formats

When considering where to add pictures we have to look at the main radio formats today. In the UK the BBC has 54.3% of the radio audience with the BBC national station Radio Two having the largest share at 15.8% and Radio One 10.1%. This gives the BBC 25.9%

of popular music radio from two of its national stations. National commercial radio, with music the main commercial radio format, has 10.7% share with Classic FM the biggest with 4.2% (UK Radio Guide 2006: 5/6)

If you check the FM stations received in a city the main radio format is the music programme with a friendly presenter. These programmes are easy to dip into at any time, the friendly presenter greeting you, no matter when you join or leave the programme. The most important programme on any radio station is its breakfast show. This is the time when most people listen to the radio, and as the station's flagship programme, it is used for a number of different purposes, the most obvious being to hook listeners into the station, hopefully for the rest of the day. (Fleming 2002: 5) Another popular radio format is talk radio that lets the listener join in a debate on many issues. Sport is a popular format with many talk radio stations and is often combined with the news. Radio news was always first with the news, radio does not have to wait for its pictures, but with new television equipment and digital cameras it is losing this advantage. The satellite link-up and the picture telephone now allow instant pictures on television news. Another format on non music radio is plays, many written for radio that work well stimulating the imagination and making pictures in the mind. Many of the radio formats could be enhanced with images. For example popular music shows could show an image of the CD or album cover while a tune is playing. The news and weather can be enhanced with some illustrations plus talk radio could show an still pictures of their guests.

The filling of programming hours with recorded music is a universal characteristic of radio stations around the world. (McLeish 2005: 158) The main format that can be found is some form of popular music. These music programmes have different amounts of talk,

for example, the BBC's Radio Two has less talking than their local BBC radio stations. Popular radio is aimed at very similar audiences, the ones identified by advertisers as having the most spending power and therefore the ones they want to reach with their message. Commercial radio has to fit in commercial breaks without losing the interest of the listener. Radio is big business with increasing consolidation. For commercial radio groups like GWR¹, the target audience is the 25 to 34 age group. (Fleming 2002: 10) this is leading to a homogenisation of the sound of radio with local stations controlled from group headquarters rather than the place their audience is based. The advantage of a big group is their costs are lower. The audience of commercial radio is a commodity sold to advertisers to fund the stations whose purpose is to attract and keep a specific demographic group of people. (Fleming 2002: 10) The BBC also has to account for its funds, so it also targets the same groups. This narrows the music selected for many programmes, although the BBC has widened its music choice by using the local BBC stations to target an older age group. Adding images and graphics could give a broadcaster something extra to increase its share of the audience if used in the right way. Commercial radio could use images to enhance the advertising slots, an important source of income for them. Digital radio has not used its format to increase the radio's sound quality compared with an FM station so digital extras could give a digital radio station the edge over existing FM broadcasts.

Radio makes pictures

Radio is a blind medium but is one which can stimulate the imagination so that, as soon as a voice comes out of the loudspeaker, the listener attempts to visualize the source of

¹ **GWR Group plc** was one of the largest radio companies in the UK until its merger, on 9 May 2005, with [Capital Radio Group](#) to form [GCap Media](#).

the sound and to create, in the mind's eye, the owner of the voice. What pictures are created when the voice carries an emotional content, interview with witnesses of a bomb blast or the breathless joy of a victorious sports team? (McLeish 2005: 1)

Radio pictures are any size you care to make them, unlike television images, where the pictures are limited by the size of the screen. But is radio more accurate? As you would expect, a visual medium has an advantage when demonstrating a procedure or technique, and a simple graph is worth many words of explanation. Also, in reporting an event there is much to be said for seeing a video, of a public demonstration, rather than leaving it to our imagination. (McLeish 2005: 2) An image such as a photograph is a highly efficient means of cultural communication and has the advantage of credibility. The photograph can give a report credibly. The mind is accustomed to using images as ideas, visual imagery is more readily abstracted than the sensations of touch, smell, sound, or taste. (Goldberg 1991: 135) Both, sound and vision are liable to distortions of selectivity, and in news reporting it is up to the integrity of the individual on the spot to produce as fair, honest and factual an account as possible. (McLeish 2005: 2) In a matter of influence a photograph has many advantages chief among them is offering evidence and authentication. Even today, when a large audience supposedly "knows" that photographs lie, the most sophisticated observers instinctively believe the camera's report, at least for a brief pulse of time. (Goldberg 1991: 19) Therefore a photograph could authenticate a radio's sound image and give a listener more information.

Radio speaks to the individual

So what makes radio so distinctive? Its availability is the most obvious answer. However the downside to the widespread availability of radio is that it tends to be taken for

granted. Because it is a medium that can be used while doing other things, whether driving the car or reading a book, it is widely regarded as a secondary medium which implies it is somehow less important than other media or lacking in some way. Although this ignores radio's distinctiveness as a mass medium that addresses the individual, it is a very undemanding friend that is always there and requires as much, or as little of our attention, as we are prepared to give. (C.F. Fleming 2003: 1)

The sights and sounds of radio are created within us, and can have greater impact and involvement unlike television, where the viewer is observing something coming out of a box 'over there'. Radio on headphones happens literally inside your head. Also radio is much more, a personal thing, coming direct to the listener. There are obvious exceptions: communal listening happens in garages, workshops, canteens and shops, and in the rural areas of less developed countries a whole village may gather round the set. The broadcaster should not abuse this directness of the medium by regarding the microphone as an input to a public address system, but rather a means of talking directly to the individual, multiplied tens of thousands, perhaps millions, of times. (McLesih 2005: 3)

The debate

Will picture radio improve the radio experience or make it less pure, a cheap version of television? The debate whether to add pictures to radio has been going on since the early days of DAB radio. Speaking in 2001 at a Radio Festival Don Bogue, CEO of Command Audio, "The radio industry needs to begin to develop new programming concepts around the idea of a personalized medium with radio on demand. People don't want radio with pictures." (Centaur 2001) On the other side of the debate according to Fraunhofer-Gesellschaft, with Picture Radio small but dynamic pictures can be used to enhance the

programmes. (Fraunhofer-Gesellschaft 2001) Both sides of the debate agree that new content is needed to make DAB different from standard radio.

Cost, especially for the smaller broadcasters, would be a strong reason for not taking up picture radio. Although picture radio costs should be a lot lower than television, video and film, the DAB images can be a smaller format and can be simpler than television, video or film. Using basic slide show software the cost would be reasonable; production of picture radio could be made on a standard PC with basic media software. Although broadcasters large and small will not risk something new, which will mean them having to spend on new production staff and equipment as well as risking the loss of listeners. Commercial radio needs to look after its share holders as it is a business. However many of the larger broadcasters such as the BBC have large resources including a video and picture archive, which they can tap into, making production much easier for them.

New services

Since 2001 there have been some new digital services added to radio. However, by 2008 most Digital radio services are little different from analogue radio with the exception of a better text service. The text display is now used for some advertising and an electronic programme guide (EPG) has been introduced, most DAB listening is on kitchen portable radios with little new content although there have been some limited experiments including DAB slide shows.

The Highways Agency launched a traffic radio service across the UK in 2007 after being available online for two years. But as there are relatively few cars with a DAB radio the service is aimed at the home or office listener before they set off on a journey. (radiotoday

[online] July 2007) This service could offer maps and graphics with the bulletins to be viewed on a suitable car radio or a satellite navigation receiver.

In January 2007 a two month trial of DAB slide-show was launched in London using the iRiver DAB/DMB receiver. (Figure 26) Three hundred of the receivers capable of showing colour slide-show images were given away for the trial. As with other picture DAB trials, besides adding images to the programmes, the prospect of new dynamics for advertisers by adding logos and pictures and more information to radio commercials was considered to be a powerful proposition. (radiotoday on-line January 2007) More slide show trials were made by the BBC but no full services have been introduced.

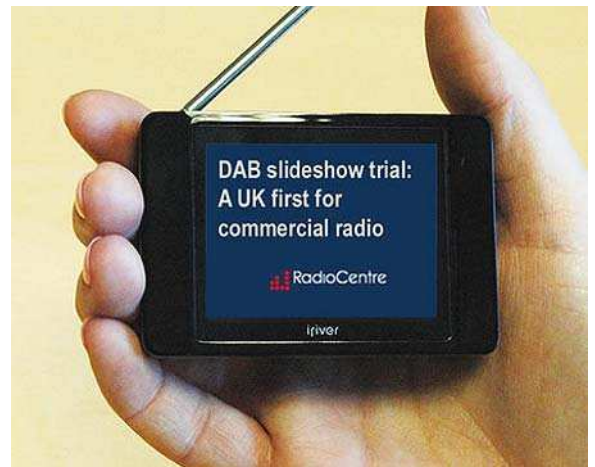


Figure 26 iRiver receiver.

Visual Radio has been introduced using Nokia mobile telephones. Vision Radio is a data and picture service that is synchronized with an FM radio service. Nokia's Visual Radio is not radio streaming as the audio is received from the FM radio embedded in the mobile telephone. The presentation of graphics and text synchronizes to the audio programming is being streamed to the phone over an independent data connection. FM radio stations Virgin and GWR starting using it in the UK. The service was introduced in Finland in 2005 and by 2008 Visual Radio was running in eight countries. (visualradio on-line 2007) Visual Radio allows mobile telephone users to receive FM radio broadcasts with fully synchronized interactive graphical content. (Figure 27) shows an

example from GWR. RCS² announced in late 2007 that their New Radio Show software will work seamlessly with Visual Radio, so that the service can also appear simultaneously on multiple digital platforms including DAB Digital Radio, and the Internet. (visuairadio on-line 2007)



Figure 27. Visual radio image.

Another service Cliq was introduced in late 2007 at first as a mobile telephone service which allows a user to buy music tracks from a DAB radio station. The Cliq service displays a live list of the most recently played songs of the radio station that is being listened to and at the touch of a button the listener can buy the songs they want. The service was also to be available from a stand alone WiFi enabled DAB radio receiver. (cliqradio on-line 2007) The Cliq service did not last long closing down June 2008. UBC media blamed the closure on a slow take up of the mobile phone platform and the limited supply of DAB capable mobile telephones. (guardian on-line 2008) Another try at music downloads from a radio receiver is to be introduced by Pure Digital. Pure have shown a prototype using their Evoke Flow radio which is internet connected by Wi-Fi. (worldddab 2009)

The internet is improving its radio service with many radio players providing good quality sound and some using a slide show. The usual radio internet stream has been only 35 kbs there is little room for a picture radio service. With the introduction of multicast,

² About RCS

RCS software is used by more than 9,000 radio stations, TV music channels, cable companies, satellite music networks and Internet stations worldwide. RCS is the world's leading provider of broadcast software. The company also provides broadcasters and webcasters tools and expertise and also develops real-time audio recognition technology.

a more efficient way to distribute live radio, a higher bit rate can be used. Radio has been delivered using unicast where each listener is delivered with their own individual stream from the broadcaster. With multicast, instead of sending tens of thousands of streams, only one stream is sent to each ISP (internet service provider) and they then forward the streams to their customers. (Digitalradiotech 2006)

DMB is an extension of the DAB system that has been modified to allow mobile television to be sent to small screen devices. DMB is popular in the Far East which has 78% of mobile television viewers. (Radio Netherlands on-line 2007) DMB TV was launched in the UK in September 2006 but take up was poor with only 6000 people subscribing. In September 2007 it was announced that the service would close in 2008. (Digitalradiotech 2008) Also the European Commission has officially selected DVB-H³ as the standard for Europe although France is to use T-DMB and DRM for its digital radio service.

With many digital platforms that could add picture's to radio adding pictures could make radio, a less pure format, as it would no longer be a single sense medium. Radio sound has changed over the years with many quality improvements with FM stereo the first change that made the sound more realistic when it was introduced some forty years ago. Today, more realistic Dolby surround sound could be added to digital radio broadcasting giving theatre in the round. A more important change and a departure from a sound only medium has been the addition of text to FM radio and DAB. With DAB having more text

<http://www.rcsworks.com/company/news/release.asp?id=1011>

³ DVB-H Digital (Video Broadcasting Handheld) is an open standard developed by the Digital Video Broadcasting (DVB) Consortium.

than FM from 8 digits to 16 and an EPG the next logical way to go is to add graphics, pictures and even video.

Identity

Although an aural medium, radio requires a visual identity to make its presence known and establish its identity, especially at the launch of a new station when huge amounts of money are spent advertising on billboards, buses, television and in the press. Even established stations advertise themselves this way and encourage listeners to promote them with give-away car and window stickers bearing the station's logo and frequency. (Fleming 2002: 58) The radio stations logo, which if displayed on a radio, can give instant visual station identity. The screen used for station identity could include an animated logo and the image would also be useful to keep the display live if a programme is not broadcasting picture radio. Giving a radio station an identifiable brand encourages listener loyalty: we want to be associated with a particular station because it has an image we like. (Fleming 2002: 45)

Pictures

With a music format, the mainstay of radio, pictures could be added to the current programmes with simple stills and web cams. This is already on many radio web sites. With music radio the broadcasters could use pictures of CD covers and simple music videos. There is already some music CDs with videos and titles added to them. It would take little extra data to add the CD cover pictures onto a music CD. This would make it possible to allow the pictures to be automatically loaded when a CD is played making radio production a lot easier. New programmes for picture radio do not have to be made as appropriate images could be incorporated into many existing programmes, but it

would help make DAB some thing new and different if programmes were specially made for a new picture format. Pictures could work on factual programmes, introductions to plays and selling goods. Cooking is a visual media and does not work very well on radio, listening to some one eating is not enjoyable radio also gardening showing the flowers and problems would work better with some images. The pictures should be able to be taken in at a glance and not used to distract the listen from the sound output.

Radio receivers

By 2008 there were only a handful of radio sets on sale in the UK to receive any new vision programmes. Few broadcasters will risk starting a service that no one can receive. However, it would be easy to add 'Picture Radio' to a radio's Internet page. The manufacturer of equipment will not invest in receivers until there is a strong demand but without them and programmes there will be little interest in starting a picture radio service. There is the opportunity for DAB to be incorporated into many products in the future such as palm computers, games consuls and mobile phones, this would start the demand for picture radio also this would help picture radio to work and be accepted.

If picture radio was introduced a side effect would be that there would be new jobs for photographers, animators and illustrators and a place for them to get a start in the media industry. Pictures would also improve the Sky television radio pages as we saw in chapter three their television page is dull. A small picture insert could easily be added to this increasingly popular way to listen to radio.

The Car

The images used on radio must take into account the use of radio in the car as an image must not distract the driver but must still inform them. Although 20% of all radio listening is in the car, only 3% of cars had a DAB receiver by 2007. (The Weekly Radio Magazine 2007: 2 issue 803) With the introduction of new radio modules and the start of DAB+ around the world in 2008 the demand for a digital radio as standard fitment in cars is expected to increase. (NXP on-line 2008) The French government has passed a law requiring all consumer devices and cars to be fitted with digital receivers by 2013. It is hoped the move will provide an incentive for European car manufactures to consider fitting digital receivers as standard in all new models. (The Radio Magazine 2009: 4)

Many cars are now fitted with a computer screen or satellite navigation as standard which could be used for other media and there are car radios with a screen for playing images on for sale. A moving image should not be displayed to the driver when the car is being driven as this could be a dangerous distraction. The Highway Code does not ban a driver from looking at a screen but it must not distract the driver from safe driving. (Highway Code 2007: 49)

Conclusion

There are those who would like to keep radio pure and not taint it with text, graphics and pictures. They could always switch off the text and images and have pure radio. Also, unless a radio station is dedicated to only picture radio, as with a cartoon network, the programmes would have to work as normal radio for the many listeners without a picture radio receiver.

However, something new may be needed to get picture DAB off the ground with new and different types of programming. Not making radio, television on a small screen, by putting on television programming making the new medium, of digital radio a poor relation of television, or a copy of the radio we already have. Early television was often thought of as radio with pictures until some producers used the visual part of the medium to its full extent to make it an entertainment medium different from the rest, radio needs to find a unique way to use images, not reinvent television. This is where simple images able to be taken at a glance could be used so radio can keep the sound its main attraction.

DAB modules could be added to many entertainment units with the right displays i.e. mobile phones, portable games consoles, MP3/4 players and portable DVD units to expand picture radio as a new entertainment medium. As with book illustration and music video the images should enhance the radio experience. On music stations the CD cover could be displayed, this could help sales; a studio cam would show the disk jockey at work and the winning goal could be inserted into a football match.

Digital radio has the ability to add to the radio experience with graphics and pictures and make it more interactive with the screen used as a menu to select many options. There will be an extra cost in programme production and the equipment to receive the service. However, there is with picture radio on digital radio and its data services the opportunity to move radio on into the future.

Chapter Six

Picture Radio

Chapter six will provide a background to the equipment available for the reception of digital radio and the receivers needed for picture radio. In addition the type of programmes that could be enhanced, as other media has, by the use of pictures and illustrations will be considered. From the research, mainly chapters four and five, work out what type programmes could use illustrations with digital radio. Also there will be a critical discussion on the use of picture radio worldwide and the place of picture radio in international radio broadcasting. Since many societies in the world are dependent on AM radio for information and entertainment picture radio might be an economic way to expand AM radio in many countries. Television expansion can cost too much to cover large low population areas. Also consider further expansion of DAB+ which Australia is using for its digital radio service introduced in May 2009 where they hope to use digital radio for additional information including pictures.

Rajar¹ figures showed that digital radio is becoming more popular as their figures published in May 2009 revealed that 33.8% of people tuned in to radio via a digital platform at least once a week on either DAB, digital television or the internet in the first three months of 2009, up from 31.4% from the beginning of 2008. Overall, digital radio accounted for a 20.1% share of all radio listening, the first time it has broken the 20% barrier. DAB remains the most popular digital platform at 12.7% of all listening also

¹ RAJAR stands for Radio Joint Audience Research and is the official body in charge of measuring radio audiences in the UK. It is jointly owned by the BBC and the RadioCentre on behalf of the commercial sector.

32.1% of homes now claim to own a DAB radio receiver. (Guardian [on-line] May 7 2009)

Digital Radio Receivers

The first DAB radio to sell for under £100-00, was the Pure-evoke1 a DAB only receiver introduced for Christmas 2002 (Figure 28) and later in the middle of 2003, Roberts Radio and Goodmans introduced a range of cheaper DAB radios.



Figure 28. Pure-evoke1

Many of their receivers had FM and AM radio as well as DAB and Goodmans included a DVD player plus an Free-view television box with a DAB receiver. The lower prices and ability to buy DAB radios in the high street shops helped start the rise in DAB radio ownership.

More than half a million DAB radio sets were sold in December 2008 bringing the total sales in 2008 to 2.08m making the total number of DAB set in the UK to 8.53m. The top selling products for 2008 included, DAB clock radios, docking stations, kitchen radios and in-car adapters. (Guardian [on-line] 26-1-2009)

By 2009 most of the major manufactures now have a DAB receiver on the market with WorldDMB listing over 1000 different receivers available to suit all tastes starting from as little as 32 Euros. Of these 190 are DMB receivers and 10 DAB+ have been added to their list. The list includes home tuners, kitchen radios, in-car receivers, PCI cards, CD players, clock radios, boom-boxes, multi-systems and hand held portable devices.

Numbers by type are, portable 412, tuner / hi fi 241, in car 57 hand held 259, pc 34, and by technology, DAB 1003, DAB+ 19 and DMB 198. (worldddab [on-line] 7-5-2009)

Different markets have different needs and the products for sale reflect this. The success of DMB² in Korea leads to a higher proportion of multimedia devices in Asian countries, whereas in Europe, audio remains the priority and so traditional radio products are most popular. (WorldDMB [on-line] March 2009)

In-home receivers

This category encompasses traditional radio devices e.g. kitchen radios, Hi Fi systems, clock radios and CD radio-cassette recorders. Whilst they focus on audio the inclusion of digital radio allows new features such as running text, rewind/pause, timer recorder, and the availability of an EPG (Electronic Programme Guide). (WorldDMB [on-line] March 2009) Radio receivers with a Wi fi internet connection for reception of on-line radio are now on sale these also include DAB and FM reception. No conventional DAB digital radio were listed in 2009 which has a screen for showing a DAB slide show or images a multimedia device has to be used.

Multimedia devices

Dominated by Korean and Chinese manufactures making products for their domestic markets this includes MP4 players, portable media players and pocket televisions. (WorldDMB [on-line] March 2009) The i-RiverB20 (figure 29) is one of the few DMB receivers available in the UK an upmarket MP3 player with a 2.4” screen, FM, DAB and DMB



Figure 29 iRiver B20 DMB receiver

² Digital Multimedia Broadcasting (DMB) is a video and multimedia technology based on DAB.

reception. The iRiver was used for the DAB slide show tests and is a ready made receiver that could be used for a picture radio service but it may not be the best to use for picture radio as the UK radio listener has a preference for more traditional radios.

Hand held devices

In addition to multimedia devices, audio based handheld products are also widely available. As silicon technology has developed, these products have become ever smaller in size and with longer lasting batteries, ensuring that they are ideal for listening on the move. The rise of the iPod has also led to the introduction of DAB enabled docking devices. (WorldDMB [on-line] March 2009) There are only a few mobile telephones with digital radio installed the majority that have a radio come with a FM radio.

In-car

The DAB family of technologies was designed to improve radio reception on the move but the in car market has been slow to take up digital radio. There are improvements in the car radio market with more car producers now fitting DAB radios as standard or as an option. PURE digital introduced a DAB adaptor which converts an existing FM car radio to receive DAB radio in August 2008 which has been well received and is selling very strongly in the UK. (WorldDMB [on-line] March 2009.)

European broadcasters, at an international workshop organised by WorldDMB, in May 2009 had a meeting with major car industry companies to discuss the future of digital radios for the automotive market. This positive move signals a closer cooperation between the two sectors in the future development of digital radio as standard in cars. Mr Quentin Howard, President, WorldDMB said “The digital radio industry sees the car

sector as key to the successful uptake of digital radio in Europe and worldwide. By working together we can ensure the effective migration from analogue to digital across Europe. This workshop has been a positive step towards achieving this aim and understanding the requirements of the automotive sector.”

Open and constructive discussion took place on key topics influencing the take up of digital radio in cars, including new and attractive content from broadcasters, production cycles for receiver equipment, transmission coverage, metadata to ensure uninterrupted listening on the move, live traffic information and many other issues. There was agreement that by working together digital radio could become standard fit in all cars, with much interest centred on the French requirement to achieve this by 2013. (drdb [online] June 2009)

Audi is leading the way in the development of DAB as standard or as an option in its cars. The Audi MMI navigation system includes DAB. DAB is available in Audi’s A4, A5, A6, A8, Q5 and Q7 models. (Figure 30) (World DMB Eureka issue 8. March 2009)



Figure 30 Audi DAB display

Car radio is important in getting digital radio rolling but the car needs a special picture content as the images used must not distract the driver. The display could be stopped when the car is moving but the main use of the radio in the car is company and information when on the move. The images can be tailored for the car [own streams] or

make all the picture radio images to cover the car and other receiver locations. This is where radio pictures must be able to be taken in at a glance to make it work and keep radio separate from film and television.

Digital Radio Mondiale

A limited number of DRM radios have been produced and the main outlets to buy them from have been on-line. Several new DRM receivers were shown at the IFA 2003 in Berlin, August 29 to September 3rd, with the DRM 2010 radio expected to be the first mass produced DRM radio that was to be ready by late 2003. In late 2006 Morphy Richards introduced the 27024 DAB/DRM radio. This was a full function digital radio that was available in Germany for 199 euros. (digitailradiotec 2007) as with other DRM capable radio it had a limited production run and was sold out by late 2008.

Released in 2009 the UniWave DiWave portable DRM radio comes with a 3½" colour TFT display, the radio covers FM, long-wave, medium-wave and shortwave. (Figure 31) The DRM features include station name and programme information, Journaline®, MOT Slideshow and listening time-shift of ten minutes. Also it has a USB/SD card reader, MP3/4 playback, e-book reader and photo album reader.

(universal-radio [on-line] 11-4-2009)



figure 31 DRM Radio
Di-Wave 100

The colour screen and conventional design would make it a good radio to use for vision radio. However this radio will have limited popular appeal in many markets as it does not have DMB or DAB included. The inclusion of other digital formats would allow it a bigger market to sell to as a radio conference in Singapore was told by Alain Masse,

Deputy Director General of Radio France International and Chairman of the EBU New Radio Group. He argued that manufacturers should produce multi-standard receivers to ensure digital radio succeeds and that radio manufacturers needed to produce affordable receivers that are multi standard so that any digital radio service can be received whether it is T-DNB, DAB, DAB+ or DRM. (Medianetwork [on-line] 18-6-2008)

Other devices

Digital radio could be added to a video games console, the Game Boy would have the correct size screen, and picture programmes could be targeted to the game players.

PAD's also have a suitable screen size and can be adapted to become a DAB receiver.

However the high cost of a PAD with a colour screen would limit its sale as a mass-market portable radio receiver.

Today video and images can be sent over a mobile telephone network. Visual Radio by Nokia uses the phone system to download data for the images to be used with the FM radio built into their hand sets. The user has to pay for this data which is also using up valuable network space. However with the addition of a DAB receiver, data could be sent direct to the mobile telephone as DAB is a good medium to send data to large numbers of devices over the air ways. The mobile telephone network would only be needed to send data back to the radio station saving the listener cost and not using up telephone network space.

Slideshow

DAB Slideshow is transmitted by some DAB/DAB+ broadcasters. WorldDMB non-exhaustive list updated in March 2008 shows four countries using slideshow, United

Kingdom, Norway, Germany and Singapore.

Australia who has started digital radio in 2009 is also going to use DAB+ slideshow. (Figure 32) is a sample of a slide taken from the DAB Slideshow service accompanying Nova 969 in Sydney this was taken on 8th Feb 2009, using an iRiver B20 device.



Figure 32 slideshow sample

Slideshow adds synchronised visual content (slides) to radio broadcasts on DAB or DAB+. Slideshow makes it easy to enhance a digital radio broadcasts with visuals using standard web image formats, and standard web publishing tools. Anything that you can turn into a JPEG, PNG or APNG (Animated PNG) can be broadcast over DAB and accurately triggered to appear in time with the audio.

Slideshow is transmitted in either X-PAD (where data capacity is allocated within an existing audio stream) or MSC (where data capacity is allocated in a separate channel on the multiplex) and can be effective at data rates from 8kbit/s upwards. Slides can be shown at any frame rate, from 1 frame per second upwards; faster frame rates (up to 10fps) are supported through use of APNG (Animated PNG) files.

The slides can be compiled manually or through an automated process, drawing in contact existing digital assets such as news, presenter information, artist images, weather, travel, promotional items and advertising information. The slides can be compressed using JPEG (which typically favours photographic content) or PNG (which favours text content).

The recent addition of APNG (Animated PNG) as a supported file type allows for slow-frame animation (at up to 10 frames per second) which can produce a visual effect similar to "Flash". Receivers that can't support animation will fall back to displaying the specified still image within the APNG file.

Radio stations can control the display of images onto the receiver screen in three ways:

- Transmit and display a slide immediately
- Transmit a slide with a specific time for it to be displayed at (accurate to 100ms)
- Transmit a slide, and then separately trigger its appearance on the screen (such as the beginning of a commercial)

The newest version of the Slideshow specification (published Q2 2008) allows for up to 64 images (or 450kBytes) to be cached on the receiver, which means programmes can pre-send slides in the background and trigger them accurately and quickly for display. If Slideshow is transmitted with dynamic bandwidth (where the bandwidth can be increased in bursts), the cache can be quickly filled prior to a series of closely timed events on-air. Older slideshow receivers continue to support caching of a single image. (worldDMB [on-line] June 2009) The structure is now in place for picture radio the next step is to get the content right.

The BBC latest radio visualisation trial for June and July 2009 offers an enhanced on-line version of some of their radio programmes. Included was Simon Mayo's BBC Radio 5 live show, The Chris Moyles Show plus Switch on Radio One, Material World on BBC Radio 4 and The Hub on Radio 6 Music. (mnilive [on-line] 3 June 2009)

This is phase 2 and a longer trial than the first in January 2009. The radio player (Figure 33) has an improved display that can be updated quicker. (BBC radiolabs 2009) The radiolabs team aim is to give a rich media experience but as radio there is too much going on and the picture insert too small, the text boxes plus the logo



Figure 33 BBC PC radio player image

dominate the display. The video took too much attention from the talking plus the sound was not in sync with the video, the gestures and face expression were lost. When a still image of a reporter was shown the sound worked better as there was none of the distraction of the poor video. This player is made for the computer and to be used in a similar way to television. To use this player on a DAB radio or small mobile telephone screen the display needs to be simpler. Most radio listeners now used a radio while doing some thing else. The use of the existing DAB text display and to give the listeners images that can be seen at glance would work better also a small stand alone display on a computer screen that can be glanced at while working at the computer would help.

Images for radio

SKY and FreeView have digital radio transmitted to a television receiver. They could improve their broadcast of digital radio by including an image on a small inset picture and include surround sound. Although BBC Radio Five live plus uses freeview images

on TV for example the cricket test score card and BBC Radio One uses BBC's television service to show music videos and live concerts.

The type of imaging that could work on radio should be small; the DAB radio profile for a radio is an audio receiver with a colour screen of at least 320 x 240 pixels (worldradio 2009) 320 x 240 pixels can give an acceptable picture on a 4.5" x 3.3" screen. The small pictures will be remote from the sound also they should be there to add to the programme's sound as pictures do with printed text. Also for picture radio to work on mobile devices it needs images to work on a small screen for example simple images and close ups.

From the study so far one of services that could be enhanced by the use of pictures and illustrations are the overseas AM propaganda programmes. This would be an area that could be used to improve its impact with images. With overseas information, many listeners would not know a personality face and may need maps to show where a news story is coming from. Pictures, as with film is a good tool for getting over a propaganda message. Many leaders use their images for maximum impact.

Much information in technical books needs pictures for clarity and for the introduction of a new car it is hard to explain in words or text only. Pictures can give a true image and save many words. The picture would help the broadcaster to give the listener the desired image they intend into the listeners mind. Also with pictures it is easier to get over product identification which makes it easier to find the product in the shops if the customer has seen the product box or logo. Advertising is used to sell pop music and

today the pop video is the main tool in promoting a song. Stills from a pop video and a CD cover could be used to promote music sales.

Radio world wide

There are 17 countries with regular DAB, DAB+ and DMB digital radio services³ plus there are 27 countries with trials and tests (worldddab [on-line] May 2009.) Most of these are in Europe and as the culture of radio listening in the Asia Pacific region to radio is less established this is where DMB is popular with many mobile television services. (worldddab.org [on-line] 2009)

There are three types of radio and television systems in the world, state-controlled monopoly, public authority and private ownership. All countries restrict the freedom of their media in some way often for what they consider as just and moral purposes. (Hilliard 1996)

Just about all first-world countries and many third-world countries have external broadcasting service of some kind. These services are usually there to enhance or create an image of the broadcasting country. They often contain political propaganda, trade and investment promotions, cultural expansion and tourism. (Hilliard 1996: 177) The BBC World Service remains the world's most popular international radio broadcaster. The BBC World Service goes out on many platforms including DAB and DRM digital radio

³ Australia, Belgium, Canada, China, Croatia, Denmark, Germany, Monaco, Netherlands, Norway, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, United Kingdom, http://www.worldddab.org/country_information

services. The BBC World Service attracted a record weekly audience of 188 million. This figure was boosted by its new BBC Arabic television channel but masked an overall decline in radio listening which was down five million to 177 million in 2008/9. UK listening to BBC World Service hit record numbers with 1.5 million weekly domestic listeners in the first quarter of this year, an increase of 9%. (Medianetwork [on-line] June 2nd 2009)

With new developments that keep cutting production costs, the cost of small colour displays is coming down in price therefore it should now be possible to make a dedicated picture radio unit at a realistic price even for the third world. Also small portable receivers with a reflective screen need less power and could run off a wind up plus solar cell power source. In some countries it would be cheaper to introduce picture radio than expand a television service to remote places.

India and Russia have announced that they are to use the DRM digital radio system. The decisions of these two big countries to implement DRM for SW and MW bands should become the driving force for the roll-out in the rest of the world and this should be a clear opportunity for manufacturers to tap into these huge markets with smart receivers offering the consumers an enhanced radio experience. (drm 19-3-2009)

After extensive trials in 2007, the Indian state broadcaster All India Radio (AIR) has decided that DRM is the best technology for converting its vast public service broadcasting network to digital. After conducting trials over a one and a half year period, AIR has started regular DRM transmissions from a 250 KW SW transmitter installed

near the capital city New Delhi in January 2009. AIR is also in the process of converting 4 shortwave transmitters (250 kW) to DRM mode by March 2009. There are plans to introduce DRM transmissions in 42 new medium wave, 36 existing medium wave and 5 new short wave transmitters. However, the cost and availability of good receivers remains the main issue in their implementation strategy for the next five years. (drm [on-line] 19-3-2009)

Australia

Commercial digital radio has launched in Australia using DAB+ the updated DAB system which had been introduced in Malta. In Australia, Perth was the first city to switch on permanent DAB+ on 4 May 2009 with more than 90% of the Perth population able to access the new free-to-air digital radio. (medianetwork [on-line] 4-5-2009) In there media release beside the usual digital text extras they have added the capacity to transmit on screen and on some receivers, a picture of a radio host, the cover of a CD or a product picture. (digitalradioplus [on-line] 1 May 2009)

DAB+ digital radio technology allows for a slide show to display images on the small screens built into some digital radios. In a number of markets a 'carousel' approach has been taken to displaying advertising messages on these screens, but in Australia the audio played on-air will relate directly to the image on screen (worldadab [on-line] 29-4-2009)

Nineteen Australian regional radio broadcasters have urged their government to make digital radio services available to all Australians, not just those in metropolitan areas. The broadcasters called on the government to make an immediate public commitment to

the allocation of VHF Band III spectrum to regional broadcasters for the rollout of digital radio services. (medianetwork [on-line] 27-4-2009)

Singapore

Singapore enjoys the distinction of being the first country to achieve 100% coverage of DAB. (Wohnort [on-line] May 2009) Digital Radio in Singapore was launched on 19th November 1999 and is a Digital Audio Broadcast (DAB) service from MediaCorp. It was Asia's first digital radio service. (mediacorpradio [on-line] May 2009)

Singapore now has a mature DAB system that provides timely and up-to-date information in easy-to-read text and graphics on its PAD/NPAD data services. PAD is the Programme Associated Data service and it includes slideshow accompanying each Digital Radio audio station showing pictures and information of the station's DJs, news headline, name and picture of classical music composers and so on. In addition, song title and artiste's names are available in their DLS service which can be seen as scrolling text display on all existing DAB radios. NPAD is the Non-Programme Associated Data service. This dedicated data service which is organised in a fashion that is similar to a website browser. There are currently more than 20 data services available on Digital Radio. These data services range from news, traffic reports, airport flight information, to entertainment news and an events guide. (Mediacorpradio [on-line] May 2009)

Zimbabwe

However not all radio listening is welcome. The authorities in Zimbabwe have banned wind-up radio receivers, a favourite among nongovernmental organisations seeking to promote access to information in rural areas. Their presence has often spawned listening

clubs accused of tuning in on “illegal” foreign news bulletins broadcast on short wave.

Batteries are almost unavailable in Zimbabwe. (Medianetwork [on-line] 18-6-2008)

Conclusion

Digital radio is expanding world wide with DAB+ giving it a fresh start. The market needs multi standard radios covering DAB, DMB and DRM this would allow the radios to cover many markets and be produced in large numbers at lower price.

DAB is the most popular digital radio platform in the U.K. with a good range of receivers except for picture radio. Europe’s market is limited to receivers for picture radio made for a DMB integrated portable media player which includes DAB. Europe and UK markets need conventional radio receivers for a picture radio service as there is only a few multimedia units designed for DMB mobile television on the UK market.

DRM has introduced the UniWave DRM radio which has a picture radio display but is another up market DRM radio with full functions. For DRM to expand they need to introduce more affordable radios for a mass market. There are enough digital picture displays around and being developed to make DAB and DRM picture radio receiver affordable.

To make the most of these products careful use of pictures and graphics will be needed to help make DAB successful for the future. Maps, diagrams, pictures of things that are hard to put into words i.e.; a new car could be used. Also images can help when there is a need to put over facts and not allow the listener to make there own picture which could

be misleading. In addition careful use of the images is needed to keep radio sound the main source of information with the images a secondary part being able to be seen at a glance.

Conclusion

Today with the introduction of digital radio there is now the means available to make a change to radio with the inclusion of text, graphics, pictures, and surround sound. The new medium of radio was well supported when it started in 1922 which helped make it popular, and many changes in radio technology over the years has helped radio change and survive. But today with so much money needed to start production of something new there has been a slow start to DAB and the extras that it can give. The addition of images and graphics could be a way to increase the popularity of digital radio. Radio has not the urgency to change today as in the 1950s when the development of television meant that radio had to change to survive.

In chapter one of this study we looked at the history of radio broadcasting over the last 80 years which includes the improvements in radio receivers from the simple crystal set to family radio mains valve receivers in the lounge then onto the personal transistor radios. Today with the introduction of digital radio systems there is the technology in place to add extra services, text and images, to radio.

In the early days of radio broadcasting, experiments to add pictures to radio were carried out. Baird's early experiments with small low resolution moving images, which he managed to fit in to the existing radio bandwidth, were partially successful. Baird's moving pictures had limited appeal with its 30 line pictures limited to close ups of people. The Faltograph added printed still images and text to radio, but it was expensive and came at a time of economic decline with the broadcasters investing in television's moving images instead. Consequently the Faltograph did not get the backing that

television had but the technology did fit into the radio bandwidth and produced better still images than the 30 line Baird's Televisor.

Today with the introduction of digital radio the listener now has a radio with the addition of extra information on its display including, station name, running text and an electronic programme guide plus a limited slide show service. There were experiments of adding video, slide shows and graphics to the digital radio systems from the start but with the introduction of digital radio the radio industry has not yet capitalized the full potential of digital radio.

Chapter two and three considers the new medium of DAB which the BBC started transmitting in 1995 and DRM terrestrial digital audio broadcasting. These are not the only digital radio systems but as we saw, DAB and DRM are robust systems that will have full data services added to them that can include graphics and pictures. They can give near CD quality sound improved mobile reception and fit more stations in to the available radio bandwidth. DAB sound quality could be better if a higher bit rate was used but this would use more multiplex space. The introduction of DAB+ with its better compression should overcome this. The introduction of DAB+ has also given interest in adding slide shows to digital radio broadcasts.

DAB is not the big leap in sound quality as was VHF FM when it was introduced in 1955. The BBC are fitting 11 stations into their multiplex and dropping the technical quality. Audiophiles will not like the compromise but the masses listening on lower quality equipment may not notice the change. Digital radio now has better sound quality received from Freeview television than from a DAB receiver, something that the

broadcasters should address. If the promised quality is not readily available there will be no reason to change from FM to DAB except to listen to a radio station that is only on DAB. The quality of Internet radio has improved making it popular to use while surfing the Internet. This should expand with more Internet users using broadband access and the introduction of stand-alone Internet radios. Therefore for DAB to make a bigger leap forward more of its data capabilities should be used, including graphics and pictures. But this may have the danger of making DAB radio into a low quality television service something between radio and television. However, used properly, pictures and graphics could enhance the radio experience as illustration has with printed material.

Chapter four examines how sound is perceived by the listener. We see that radio is a hot medium, a quality single sense medium that allows less involvement for the listener than a cool medium. We receive sound and then make pictures in the mind but to make sense of sound we need codes to know what the sound is and to make sense of what we hear.

Also, in this chapter we saw that with picture radio, the visuals should be presented in such a way as to keep the sound as the dominant medium. Broadcasters need to understand the relationship between sound and vision otherwise picture radio would become the cool medium of television and lose its strong influence on the emotions through sound. Also as radio listeners are often doing something else while listening to the radio the images should be able to be taken in at a glance as this would also help keep the listeners attention on the sound content.

Chapter five analysed some of the debate for and against picture radio. Will it improve the radio experience or make it less pure, a cheap version of television? Many

broadcasters are happy with what we have now and their only interest in DAB is the number of extra channels that are available. The extra cost of programming and the availability of suitable receivers also will be a barrier for picture radio. However for DAB to succeed it may need something extra to make it a success. Limited text is already available on FM radio. DAB has more data capability so the next step would be to add graphics and pictures, which DAB transmissions are capable of sending to a suitably equipped receiver.

However, something new may be needed to get picture DAB off the ground with new and different types of programming. Not making radio a poor relation to television, by putting on television programming on a small screen, but making the new medium of picture radio something special in its own right. Early television was often thought of as radio with pictures until some producers used the visual part of the medium to its full extent to make it an entertainment medium in its own right. Radio needs to find a unique way to use images, not reinvent television. This is where simple images able to be taken at a glance could be used so radio can keep the sound as its main attraction.

Chapter six provides a background to the equipment available for the reception of DAB radio. The first DAB receivers were available in 1997 they were high cost low volume car radios and up market hi-fi boxes. Sales, at first, had been slow with only 50,000 sets sold by mid 2002. This changed with the introduction of the sub £100-00 radio and today there are many radios for sale starting for under £30-00.

Today DAB is the most popular digital radio platform in the U.K. with a good range of receivers except for the reception of picture radio. Europe's market is limited to receivers

for picture radio made for a DMB integrated portable media player which includes a DAB radio. Europe and UK markets need conventional radio receivers with a suitable display for a picture radio service.

To make the most of these products careful use of pictures and graphics will be needed to help make DAB successful for the future. Maps, diagrams, pictures of things that are hard to put into words i.e.; a new car could be used. Also images can help when there is a need to put over facts and not allow the listener to make their own picture which could be misleading. In addition careful use of the images is needed to keep radio sound the main source of information with the images a secondary part being able to be seen at a glance.

Also chapter six considered world radio where DRM, digital radio for the lower radio bands has had limited take up plus a limited range of radios. Although the introduction of the UniWave DiWave portable DRM radio which comes with a 3½" colour TFT display, could help promote a DRM picture radio service but the DRM service also needs affordable receivers to expand its listener base.

The BBC internet visual radio demonstrations has shown not to use video, as still images work better at keeping the sound up front. The experimental player was too fussy and not be able to be taken in at a glance, too much like poor TV. It also needed an option to sit the player's video screen on top of the P.C. work so that the images could be seen while working on the P.C. The Danny Baker Show broadcast on radio 5 and Free-view television had the same type of production giving the listener information overload

removing the attention from the sound show which is an important part of radio. (Figure 34)

It is important to keep away from video for example:

1. Takes up too much attention as radio is a sound medium.
2. Not suitable for in the car when moving. [takes too much attention from the driver]
3. Could be used sparingly for impact. [to grab attention]
4. Radio is a sound medium using too much video is too close to television.



Figure 34 Danny Baker Show

Digital photographs would be better to use for example:

1. Little processing needed to receive and transmit a digital photograph.
2. Listeners could e-mail digital photographs to a studio.
3. A photograph can give credibility to a news story. Newspapers use this.
4. Can give a clear image when words alone can not explain something.
5. Should not use video in the car but a still image would work if shown long enough.

Picture radio should be kept simple and not overwhelm the sound with lots of text and graphics giving the listener information overload. Also use it to entertain the listener with the images, not only use them to sell goods, or have an automatic revolving slide show that has nothing in common with the show.

Domestic radio receiver design has mainly focused on retro and safe looking radios. The UK market needs conventional radios with suitable displays as only DMB portable

television receivers are on the market. Most current DAB receiver's displays are small with only two lines of text. This could be bolder for DAB radios to look different from a non DAB radio. There is now some new radio coming on the market such as the introduction of the Pure Sensia (Figure 35) an FM, DAB and internet-connected radio which has a large



Figure 35 PURE Sensia

5.7" high resolution touch screen. With a growing set of custom PURE 'Apps' such as weather, news, Facebook or Twitter, that can be accessed using the touch screen. Also, new broadcasting material such as slideshows can be displayed. (Eureka 4: May 2010)

Digital radio has the ability to add to the radio experience with graphics and pictures and to make it more interactive, with the screen being used as a menu, to select many options. There will be an extra cost in programme production and the equipment to receive the service. However, there is, with picture radio on DAB along with its data services, the opportunity to move radio on into the future. The simplest use of picture radio would be to use it for the display of a radio station's identity or use an auto system to show a picture of a C.D. cover when a tune is playing and the station logo or slide show at other times. This also could be used when a presenter is too busy to add images to a programme. Also make the picture radio service work on all platforms from the home radio, in car displays, mobile telephones and the personal computer. Above all keep it simple.

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Appendix 1

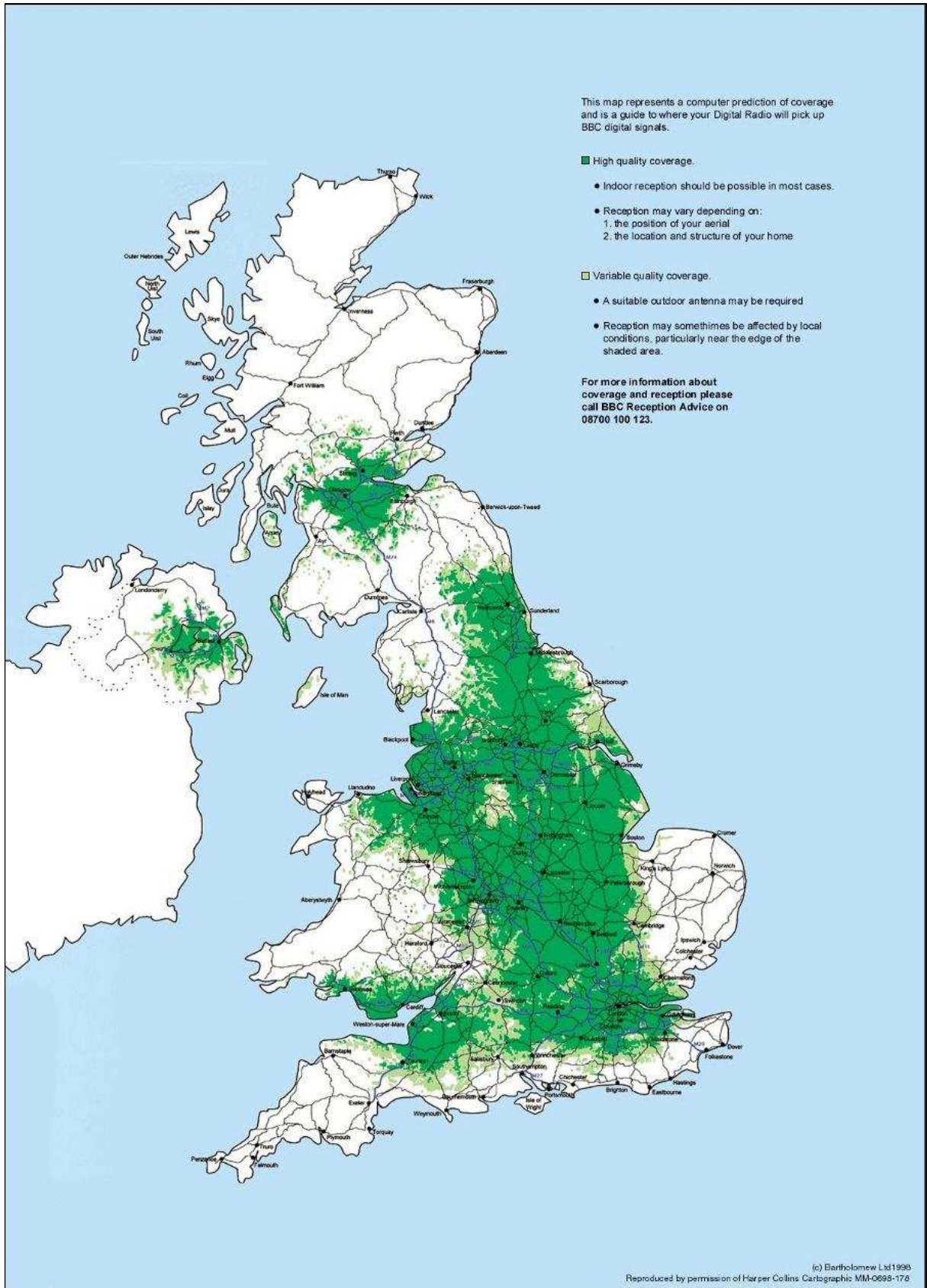


Figure 14 BBC early DAB coverage.