Visual Broadcast Meteorology; Communicating the Weather Story

by

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ABSTRACT:

Many millions of people watch television weather forecasts everyday, but a detailed analysis of the information such forecasts convey and how and why viewers watch them has not previously been undertaken. New technology is presenting television stations with both challenges and opportunities. Viewers no longer have to rely on watching a forecast at a time dictated by the television station, they can now choose when, where and how to watch forecasts. This thesis reviews the visual presentation of weather forecasts from paintings of the 14th Century to the latest on-demand technology. Viewers are surveyed to assess their recall of weather forecasts and their preferences for how information should be presented, displayed and broadcast in order to maximise audience figures and the financial attractiveness of the television weather forecast to potential sponsors or licence fee payers. Using the results of the research, a proposal is made for the creation of an internet based television weather channel.

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ACKNOWLEDGEMENTS:

First and foremost my thanks have to be extended to my family. This thesis was conceived, researched and written whilst running a company, presenting on television, writing a book and being a father and husband. The work involved in these tasks is nothing compared to the commitment undertaken by my wife Kathryn and my children Elizabeth and Daisy in supporting me through the various crises that ensued over the past few years whilst studying for a Masters Degree followed by this PhD. There have been many times when my research and writing has come before days out and other family events and I will never be able to adequately repay this debt to Kathryn and the children. It's now time to concentrate on being a husband and daddy!

Of course one needs inspiration and encouragement to undertake a PhD and this has been given to me by my parents. They studied hard whilst continuing to work and bring up a family, demonstrating that education does not follow any pre-prescribed path. The ability to further ones own knowledge is in the gift of all of us, and with a little nurturing a seed sown can blossom, even if it does take a few years to fruit.

At the University of Birmingham I must thank my supervisor Professor John Thornes for putting up with my ramblings. John has guided me through this learning path with enthusiasm, and his suggestions as to how improvements could be made to what at times was a series of notes, thoughts and anecdotes. I must also thank those folk, many of them anonymous who back in 2003 agreed to accept a 32-year old television weatherman with 3 GCSE's, no A-levels and absolutely no experience of University onto a Masters degree course. You took a gamble on me; I hope that it has paid off.

CHAPTER 1:

INTRODUCTION

1.1 Introduction

Each day millions of people switch on their television sets and watch a weather forecast. They will have differing reasons for watching the forecast; it may be before a programme they wish to see, it may be that they have switched on specifically for the forecast, or it could be that the television is 'on' merely as a form of background noise.

Whatever the viewers' reasons for watching, the aim of the television weather forecast is to convey complex scientific information, clearly and concisely. It is the most prevalent, if not the only example of science communicating with the public each day and Wilson (2008) states that it *"may be the only source of scientific information that some people encounter on a regular basis"*.

On-screen forecasters are constrained by the technology available to them, both graphically and the transmission medium. High definition television (HD) will allow higher definition maps to be broadcast to viewers showing more detail in each forecast. However, the quality of the image available must be matched by the accuracy of the forecast.

Technology is not the only constraint to on-screen forecasters. Television programmes have only a limited amount of time available to them, this usually changing on a daily basis. Recorded broadcasts tend to be for a fixed duration, this duration being made aware to the forecasters several days before transmission. However, live broadcasts are often contained within live news programmes and therefore timings may contract or expand beyond those initially made available to the presenter. Often the presenter is unaware of the exact duration of a forecast before the broadcast begins. Only when the weather presenter has been talking for a few seconds will they be made aware of how much time is available

for the broadcast. Therefore any graphics that have been prepared for the bulletin must be flexible enough given the flexibility of the duration of the forecast.

From a viewers perspective various emotions will be experienced while watching a forecast. Television weather presenters often use phrases such as "beautiful sunshine" or "damp and dreary", eliciting such emotional responses from viewers. The emotional reaction to television is a known phenomena, with research into emotional responses to adverts (Goldberg & Gorn 1987) finding that commercials performed better in happy programmes than in sad programmes.

In an age of advancing technological capabilities television stations are presenting forecasts using increasingly sophisticated graphics. The ability to show complicated weather patterns and animations certainly enables television stations to show graphics capabilities to the full. However, what looks 'good' is not necessarily what will be most remembered by the viewer.

Correspondence from viewers to television stations suggest, anecdotally, conflicting opinions as to what weather charts they would like to see. Some prefer seeing surface pressure chart forecasts for the coming days; others claim not to understand them, whilst satellite and radar pictures are requested by those who use them.

The author maintains that for the majority of viewers the forecast is about how warm, cold, wet or dry the coming days will be. Anything extra within the weather show is merely entertainment; but is this true? The science of meteorology may not be of interest to an average viewer if presented in its raw scientific form, therefore it is important that the images shown to viewers, and the gestures and narration of the presenter, enhance and simplify the forecast information to be conveyed.

Thornes (2008) discusses how, with reference to the paintings of Constable it is not only necessary to be scientifically correct and visually accurate in created images, but it is also important that a "visual ecstasy" is achieved in order that images can be communicated

effectively and be memorable to the audience. If it is possible to achieve such an ecstasy or perfection in a television weather forecast, would this make the forecast more memorable and therefore more useful to the viewer?

Such goals may also be attractive to the television companies. If visual ecstasy or perfection in a television weather forecast can be achieved, viewing figures may increase accordingly. For commercial broadcasters, such as the regional ITV stations, this may result in the weather forecast becoming a more attractive feature to sponsors and thus lead to increased revenues for the station, and increased purchases of the advertiser's service or product. For state-funded broadcasters, such as the BBC, maximisation of visual ecstasy may lead to an increase in viewers and therefore a case for more funding from tax-payers via an increased television license fee. Television is not the only way that the public may obtain weather information; many other media carry weather forecasts too.

Newspapers have for almost 150-years printed daily weather reports and forecasts. Over the years forecasts have evolved in newspapers, some featuring colour, other producing forecasts only in black and white. Such forecasts are restricted temporally as there is such a long lead time between the forecast being produced (newspaper forecasts are generally issued around 4pm the day preceding publication) and it finally ending up in the hands of the reader. By the time the forecast is read there may have been significant changes to the meteorological situation and the forecast amended accordingly.

The first mass broadcast of a weather forecast took place via BBC radio on 14th November 1922. National and local radio stations provide weather information to listeners, usually being read by a presenter or news reader. Forecasts vary considerably, as do the length of broadcasts. Some stations, such as BBC Hereford & Worcester employ meteorologists with local knowledge, whilst others 'rip and read' forecasts delivered direct from the forecast supplier. The length of forecast varies considerably and the amount of knowledge a viewer can recall is debatable.

Radio has traditionally been the mobile form of the television weather forecast. Before the advent of the internet, radio was available where television could not be received, for example when driving or camping. Radio is generally available where other mediums are not. Even today there are areas where no television or mobile telephone services are available, but analogue radio signals are still able to be listened too. The Shipping Forecast is broadcast to mariners at sea on longwave, thus extending the range of the transmission beyond that of FM radio signals, terrestrial television or mobile telephones and ensuring that the forecasts is available to those who need it. Whilst not a visual broadcast, listeners to radio weather forecasts may visual the forecast in their minds, perhaps imaging how conditions may be if one were located in the place the forecast was referring too.

Instant communication methods have developed rapidly over the past two decades. One of the major sources of instant weather information is now the internet. Massive amounts of weather data are available from numerical models. Forecasting websites then manipulate this data enabling forecasts to apparently be produced down to postcode level. Of course, this does not mean that the forecasts are more accurate than those printed in newspapers, broadcast over the radio or displayed on television, although the public might perceive that because a forecast is given for such a localised area, the forecast should be expected to be more accurate than a forecast making a prediction for a whole country.

Mobile delivery methods are further enhancing the internet as a broadcast medium and are superseding more traditional radio transmission. It is no longer necessary for a user to be situated at a desktop computer, connected by a wired internet device to view internet files. Many mobile telephones now provide the same functionality. Forecasts can be viewed over the internet, audio files listened to and visual files viewed wherever there is mobile data network coverage.

Television is also evolving. One can now use the red button to view weather forecasts 'on-demand'. Until recently it was necessary to know the time a forecast was to be

broadcast in order to view or record it to video for watching at some future date or time. Viewing on-demand enables the viewer to choose when they watch a forecast. The broadcast is permanently available to view, thereby circumventing some of the advantages of internet view-on-demand services. However, forecasts via the red button do take some time to download and view via a digital television decoding box, and therefore the service is not truly instant. Loss of signal during inclement weather can be experienced.

Broadcasters are aware of the advances in technology and the need for viewer interaction. This is evidenced by the number of pleas during television news bulletins for viewers to submit their pictures or views on a particular news item. A visit to any news website reveals a form for viewer comment and feedback. But is television, broadcast by terrestrial or digital mediums, able to satisfy the requirements of those who are interested in the weather, or those who rely on the weather forecast for social or economic gain?

1.2 Broad Research Outline

This research aims to discover what components are required in order to achieve the ideal television weather forecast. The elements required to produce a television weather forecast include:

- the design of the weather graphics
- the length of time of a bulletin
- the graphical images and sequences contained within the bulletin
- the ordering of the graphics
- the perception and recall of a forecast by the viewer

Research has been carried out into the recall of television adverts amongst viewers. Forecasts tend to follow, or be included in news bulletins and this approach does seem

supported by research such as that of Furnham et al. (2002) in which the recognition of an advert was significantly related to the content of a programme.

In a paper discussing how television in the United States covers weather related events, Ungar (1999) highlights how heat waves, droughts, hurricanes and floods have increased on network news bulletins between 1968 and 1996. A marked increase in the coverage of weather events is notable from 1988. It seems that television stations are selective in their coverage of weather stories; the number of stories regarding droughts are about twice that of heat waves. An interesting footnote is that U.S. networks have not increased their coverage of foreign weather events.

Although television stations acknowledge the importance of weather stories, the weather forecast is seen by television news programmes as an item which can be shortened or lengthened in time, depending on the prevailing stories within the programme.

It seems that television stations do not know how to treat weather broadcasts. They appear to understand that viewers regard it as important that a programme should contain a forecast, but television stations do not have an understanding as to how and why viewers watch forecasts, and what weight is attached to the information contained therein.

This research aims to assist television stations who are developing weather broadcasts by investigating, through content analysis and viewer surveys, answers to the following questions:

- Which depiction method is required by the user – symbols or contours?
- Is a presenter important for conveying the forecast information - in-vision or out?
- How much of the broadcast can a viewer remember?
- Is new technology being used by the audience?
- What is television weather forecast 'perfection', and has this been achieved?
- Is the length of the forecast relevant to the viewer?

By looking at the forecast as a whole, the research will attempt to provide television stations with an idealised scenario in terms of what viewers expect to see, how they remember forecasts, why they would watch forecasts and therefore how television stations may maximise their revenues, either from commercial activities or government funding.

1.3 A Note Concerning Forecast Accuracy

The purpose of this thesis is to investigate the background to television weather forecasts and assess what viewers remember and how such forecasts might be improved by the introduction of new technologies. Forecast accuracy has not been investigated and viewers are not asked about their perception of accuracy.

How forecast accuracy can be measured is also open to debate. An example of this was shown by Thornes & Proctor (Thornes & Proctor 1999) with the comparison between claimed forecast accuracy in 1885 of 79% (Gaster 1896), and 1997 of 86% (Ewins 1997). During this time there have been advances made in forecasting techniques, including the advancement of empirical systems together with the rapid increase in computing power and the advent of numerical weather prediction. By simply forecasting the same weather for tomorrow as that which occurred today Thornes & Proctor found that a 77% accuracy rate could be achieved, with problems created by the verification method used to assess the accuracy of such forecasts.

However, it cannot be denied that forecast accuracy is of importance, although how important is unclear. The Royal Meteorological Society commissioned a report (Mailier *et al.* 2006) to investigate whether there was a desire for a standard quality assessment for weather forecast providers to assist users of such information in determining where they choose to purchase meteorological services and/or data from.

While not directly addressing the issue of accuracy, both providers and users were asked in a survey about their practices in assessing forecast quality. Of the eighteen providers responding to the question, *"How often do you issue forecast quality assessments to your customers?"*, only three of them provided such information at least once a month. The providers clearly thought that this information was of use to customers because when asked, twelve of them thought the information would be useful with four being uncertain (only sixteen replied to the question).

When users were asked, *"Do you believe that receiving quality assessment information from your provider would benefit you as a user?"*, only four of seven respondents said yes.

So clearly there is some scope for an investigation into forecast accuracy. Any operational forecaster is always having fun poked at him or her by people saying that forecasts are inaccurate, but these findings pose the question of how important is accuracy to the customer? It seems that it is not that important and anecdotal evidence from the author would suggest that of more importance to the user is trust in the source of the information. There is an acceptance that forecasts will be inaccurate on occasions but a knowledge of when and why such occasions are likely to occur is critical to the customer enabling more effective planning of operations based around forecast information.

1.4 Who are the United Kingdom Television Stations?

Television in the British Isles has undergone a dramatic change during the previous two decades. In 1982 there were three television channels available to British viewers; that year saw most of the audience watching Independent Television (ITV) with a 49% audience share.

By 1991 satellite television and cable television audience figures became available for the first time, with a 4% audience share during that year. By the final year of the survey, 2005, ITV had lost 27.5% of it's audience with a share of 21.5%.

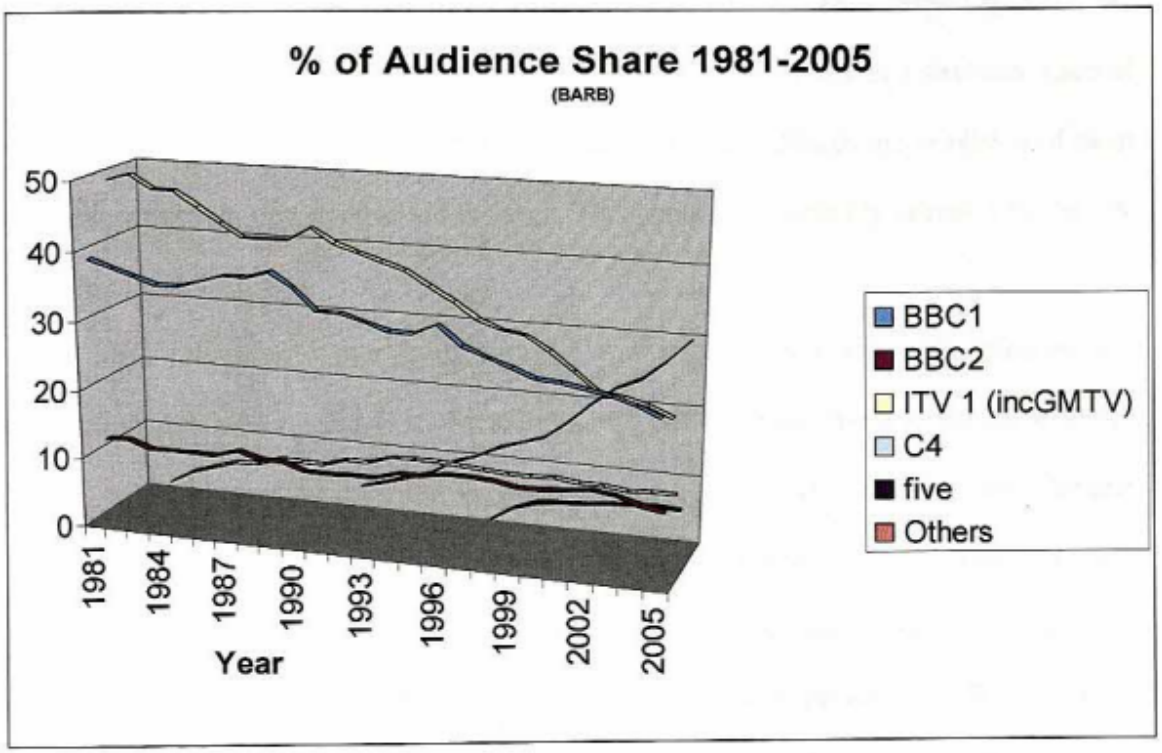


Figure 1.1 Percentage of Audience Share for British Television Stations 1981-2005 (BARB). Note how the audience share of the traditional broadcasters has fallen sharply, whilst the share of "others" (satellite and cable television) has risen rapidly.

This change in viewing choice is graphically illustrated in Figure 1.1. It can be seen how the audience share of BBC and ITV have fallen steadily, whilst the rise of "other" channels has risen rapidly during this time.

Each television station has a specific target audience, this is vital if a commercial television station is to attract advertisers and remain financially viable. Some televisions stations will not require forecasts as they are not seen as necessary to fulfil the station's

viewers' needs (for example certain shopping channels), whilst others may not be able to afford the purchase of such forecasts.

Terrestrial television stations have traditionally enjoyed most viewers per station. ITV is split into regional companies, and these can be seen in Figure 1.2. There are fifteen regional licenses with twelve being owned by ITV plc the other three owned by SMG plc (formerly Scottish Media Group plc), Ulster Television plc and Channel Television. Each of the ITV companies broadcast their own weather forecasts, although the provision of most forecasts is through one, centralised contract. This contract is currently operated by the UK Meteorological Office.

BBC television issues both national and regional forecasts. All forecasts use information provided by the U.K. Meteorological Office, input into a computer graphics display system supplied by Metra Information, a subsidiary of the New Zealand Meteorological Service. Although data is now wholly provided by the U.K. Meteorological Office, some regions did until 2008 use private weather forecasting companies to interpret and present the information; notably BBC East used forecasts provided by WeatherQuest Ltd, an independent weather forecasting company based at the University of East Anglia. These companies may provide such information in future, subject to contract negotiations.

Some of the newer non-terrestrial television stations do provide weather forecasts to viewers, for example Sky News. As the number of television stations have increased, more weather companies have become involved in supplying television stations with weather forecasts. Competitive tendering has led to a reduction in the price paid by television stations for forecasts (personal communication) and this in turn has led to weather companies providing forecasts which cost less to produce; forecasts which have minimum human intervention and are largely model produced are now common-place. A result of competition has been a reduction in the number of companies supplying weather forecasts. Apart from Weather News International (who supply weather forecasts to Grampian

Television) and Weather Consultancy Services (who supply forecasts to the Welsh television station S4C), most UK television stations are supplied forecast data by the U.K. Meteorological Office.

Figure 1.2 ITV regional television stations (ITV 2008). Each station has it's own weather forecast. Note that some regions are split into sub regions, using the same forecast provider.

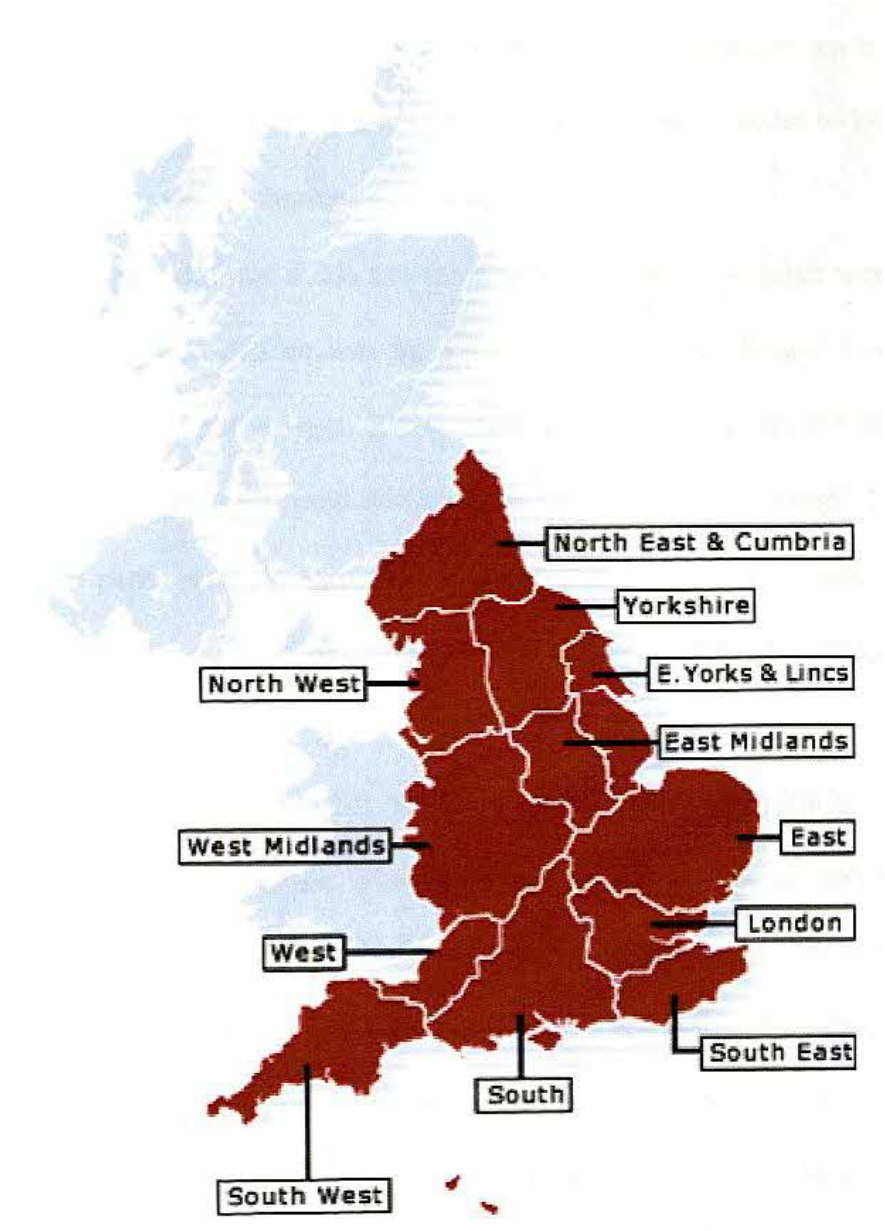


Figure 1.3 BBC English Regions (BBC 2008). Note that Scotland, Wales, Channel Islands and Northern Ireland are in addition to these regions.

1.5 Who are the Audience?

Television stations target the needs of specific audiences. It is very important that television stations understand their audiences in order to maintain and increase audience share, and to provide advertisers with a target market to whom their clients promotional campaigns will appeal. Journalists use a technique called 'news framing' when they compose a news story thereby aiming to maximise viewer accessibility for a particular story

(Valkenburg 1999). This technique involves a story being written in such a way that it attracts maximum viewer attention, and may be subtly changed in order to better reflect the demographics of the television channel's audience.

Could a similar technique made available to the television weather forecast, 'weather framing', aid in the creation of forecasts for a particular station audience? For example, if a television channel knows that most of it's viewers are under 25 years old, then it is likely that they will want rapidly presented forecasts, concise and to the point. Those channels with an older, or perhaps more educated audience, may present longer, more detailed forecasts. Each channel would be 'framing' their forecasts to meet the expectations of the audience.

The Office of National Statistics (ONS) is a government organisation which operates the Government Statistical Service. The ONS carries out a regular survey entitled the General Household Survey as well as others relating to ownership of items within UK households. The results of a study into ownership of ICT equipment between 1996 and 2006 (ONS 2006a a) (Figure 1.4) shows a significant rise in the number of homes with access to digital television services. In 1996 this figure was around 19%, but by 2006 it was closer to 68%. Digital television allows the audience access to many hundreds of television stations, compared to five stations available on the UK terrestrial television service.

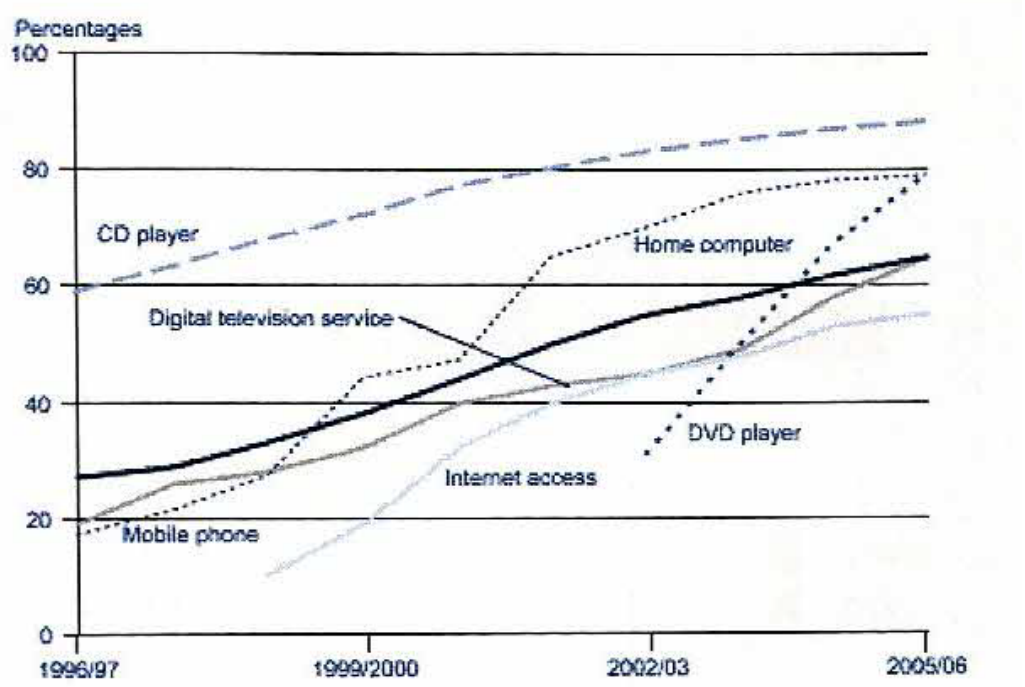


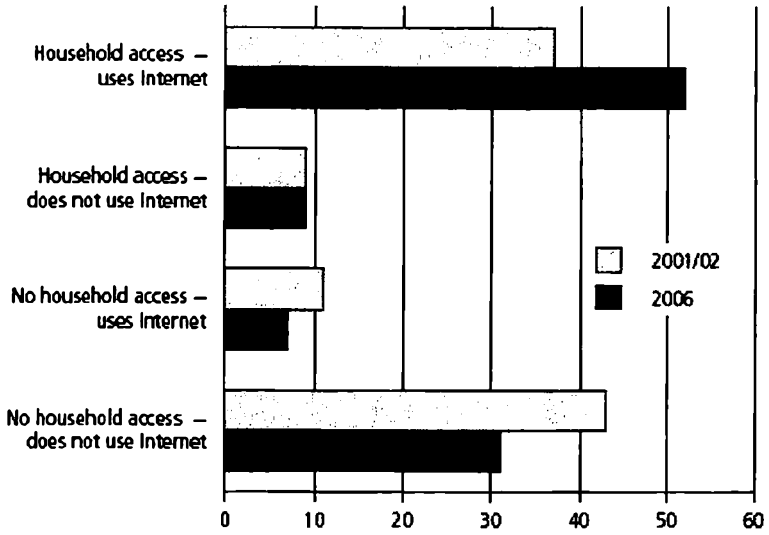
Figure 1.4 Office of National Statistics (2007) showing the use of ICT equipment in the home between 1996 and 2006. Note the increase of Digital television services.

A further survey carried out by the O.N.S. (ONS 2006 b) entitled *"Focus on the Digital Age"*, found that access to the internet from home had risen to 52% (see Figure 1.5). The rate of growth has slowed somewhat since 2001, when in the twelve months to March 2001 the greatest annual growth in internet access from home was recorded at 13% (ONS 2007). This figure is somewhat surprising as one would have assumed that with the rapid advance of broadband installations, penetration of home internet access would have been higher in the years post-2001.

Current Internet use[1] and home Internet access[2]

Great Britain

Percentages



1 Current Internet users are defined as those who have gone online in the last three months.
2 Data for 2001/02 were collected in April, July, October and February. Data for 2006 were collected in January, February and April.

Source: Omnibus Survey, Office for National Statistics

Figure 1.5 Office of National Statistics Focus on the Digital Age Survey 2007 (ONS 2007) showing change in internet use from 2001/2 to 2006.

The internet can provide a means of delivery of television broadcasts into the home, but most television broadcasts are still received by terrestrial or digital broadcasts. As analogue signals are due to be terminated between 2008 and 2012 (U.K. Government 2008), many households are being encouraged to switch to digital television. The reasons viewers give for acquiring a digital service are shown in Figure 1.6 (ONS 2007). It seems from this survey that there is a requirement from viewers to have access to more channels with 69% of respondents stating that this was their reason for acquiring digital television.

The Office for National Statistics define categories for socio-economic groups as in Table 1.1 These categorise a person's socio-economic status on a scale from 1 to 8.

Television stations use these (and the older socio-economic ABC scale shown in Table 1.1) to assess who is watching and when.

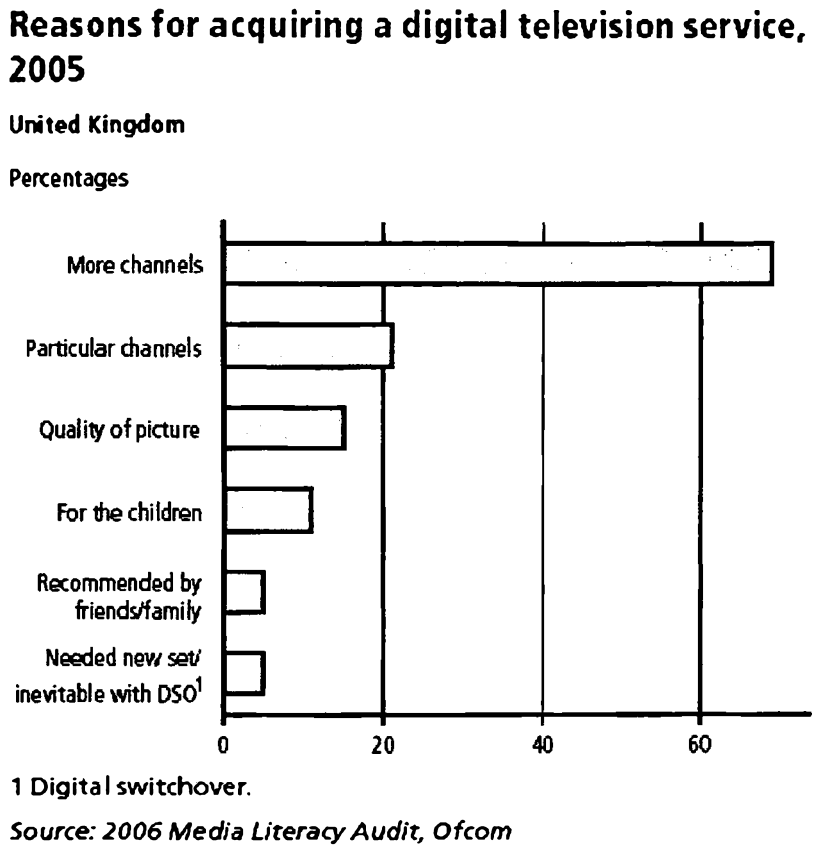


Figure 1.6 Office of National Statistics Focus on the Digital Age Survey 2007 (ONS 2007) showing reasons for acquiring a digital television service.

Audiences (demographics and total viewers) vary day to day, week to week, month to month and hour by hour. Television stations are aware that audience figures fall during the summer months, with peak viewing hours during the darker, colder, winter months. Figure 1.7 shows how viewing hours have varied from 2000 to 2006. The peak in weeks 23 to 26 for 2002 can be attributed to the 2002 World Cup, with a further peak expected in similar weeks during 2006.

The National Statistics Socio-economic Classification Analytic Classes		
1	Higher managerial and professional occupations	
	1.1	Large employers and higher managerial occupations
	1.2	Higher professional occupations
2	Lower managerial and professional occupations	
3	Intermediate occupations	
4	Small employers and own account workers	
5	Lower supervisory and technical occupations	
6	Semi-routine occupations	
7	Routine occupations	
8	Never worked and long-term unemployed	

Table 1.1 Adapted from Office for National Statistics Socio-economic Classification Analytic Classes (ONS 2008)

Television companies are aware of whom they are broadcasting too. This awareness, through constant market research, enables the companies to target programming to their audiences. In the case of independent companies this increases viewing figures. Therefore advertisers know that their marketing campaigns will reach more people to whom their product may appeal and are willing to pay more for that advertising, thus increasing television company revenues.

A state owned corporation, such as the BBC also needs to maintain audience figures. This enhances the justification for licence fees and ensures that any future request for an increase in the fees is looked upon favourably by government, although Ministers can still deliver licence fee increases (or decreases) somewhat below the hopes of those in charge of state funded broadcasting services (DCMS 2007).

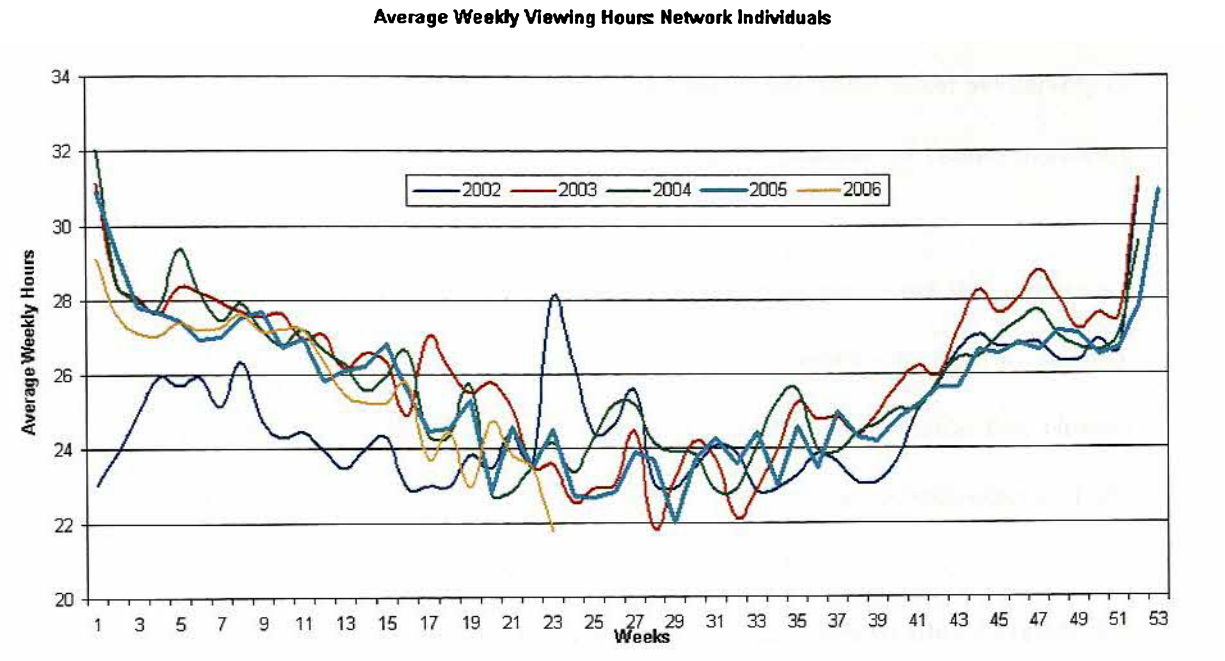


Figure 1.7 Average Weekly Viewers Hours 2000 to 2006. (BARB 2005).

1.6 Summary

Television stations include weather forecasts within their schedules because they assume that viewers want them. Little research has been completed regarding television weather forecasts and it is hoped that this thesis should go some way to filling that research gap.

Chapter 3 provides more details of the limited research that has been carried out with particular reference to Rose (2001). This provides a useful model for the deconstruction of the television weather forecast, which is necessary if one is to understand the graphical qualities of the forecast graphics and attempt to improve the presentation of forecasts. By investigating the Site of Production, Site of Audiencing and the Site of the Image Itself it has been possible to better assess how the television weather forecast 'works'.

Of course, there is no point in producing a weather forecast if viewers are not going to watch. Methods of viewing are also important and surveys such as BARB (2005) have

shown that the audience share of satellite and cable broadcasters has risen significantly in recent years. The method of delivery is important too, and is changing as the availability of broadband internet access in homes increases, as does the number of homes receiving television signals from digital sources.

This complicated picture of who viewers are, and how and what they remember when watching television weather forecasts is one that has not previously been researched. Such information is vital if television stations are to deliver the information that viewers require, and could have profound implications for the commercial attractiveness of the television weather forecasts as shown on independent television.

The following chapters examine the history of the television weather forecasts and gather some proprietary survey data in order to suggest ways in which the forecast may keep pace with technology and deliver information that satisfies the needs of viewers, television stations and advertisers.

CHAPTER 2:

VISUALISATION OF THE WEATHER – PAST AND PRESENT

2.1 Introduction

Many viewers would not place the television weather forecast in the genre of 'art'. It may appear as a presentation on our television screens everyday, but to most viewers the forecast is just 'there'; a regular feature of the television schedules and one which conveys information to viewers about the weather of the day(s) ahead.

However, as with other art forms, the television weather forecast must try to achieve viewer satisfaction if it is to remain memorable. Nicholas Mirzoeff (2002) in his book The Visual Culture Reader states, "*...visual culture is concerned with visual events in which the user seeks information, meaning or pleasure in an interface with visual technology.*" A statement with which the television weather forecast almost perfectly concurs.

Mitchell (1994) agrees that "*The fantasy of a pictorial turn, of a culture totally dominated by images, has now become a real technical possibility of a global scale.*" Relating this to the television weather forecast, our society is now so reliant on images, and is expectant that they will be shown; it would be hard to portray the weather story without them. This is confirmed by the evidence gathered in the content analysis of weather forecasts in Chapter's 3 and 4, which show that very few display text.

Weather has always held a fascination for humans. Folklore is mentioned in the Bible, "Jesus said, "When in evening, ye say, it will be fair weather: For the sky is red. And in the morning, it will be foul weather today; for the sky is red and lowering." ((Matthew 16: 2-3). The depiction of weather can be seen in art works dating back centuries.

This chapter examines the history of the portrayal of weather and climate, culminating in the television weather forecast. It examines how weather phenomena have

been portrayed by the most famous of 'weather artists', Constable and Turner, and what cultural symbols a television forecast portrays.

2.2 Seeking the Information

All consumers of the media are seeking information, whether consciously i.e. by researching information about a particular or series of news stories, or subconsciously, i.e. browsing a random internet site during some free time. MacDougall (2003) describes the move away from the printed media, towards that of the image as a complex and protracted phenomena.

The ultimate aim of a television weather forecast is to convey weather information to the viewer in a way which can be easily interpreted and understood. The content analysis carried out in Chapter 3 reveals that most television stations choose to do this through graphical representations of the weather. Not only are forecasts regularly represented by graphical imagery, artists have for many centuries used the weather as a method of conveying information.

Users of weather forecasts will seek information from many sources and by using several media. Depending upon the immediacy of the media, forecasts can be available instantaneously on demand, consisting of the very latest meteorological data, or could be several hours old and consist of data produced up to twenty four hours before publication.

Many of these media portray the weather forecast through imagery. It is accepted that the user will understand and be able to satisfactorily process the information being displayed, and therefore will adequately relate the pictures seen to the expected weather. But how has the depiction of the weather changed over time and how do each of the mediums represent weather (present or forecast) and what imagery is displayed and in what format?

2.3 Weather in Paintings

Modern times have presented the opportunity to display weather conditions in pictorial form through many mediums; internet, television, mobile telephones, but also books and newspapers. Technological advances have enabled such imagery to become widely distributed. However, prior to the advent of such technology drawings and paintings were the only ways that humans could depict weather conditions in a visual form. Thornes (2000) states, *"...therefore it is surprising that there are relatively few studies of the history of skies in landscape painting"*.

Most western art, prior to about 1400 mainly depicted religion (Robinson 2005). Burroughs (1981) attempts to explain this phenomena by suggested that during this period the weather was so mild and benign, little attention was given to the weather, it was a rather insignificant event.

By the early 1400's the number of severe winters begin to increase and we start to see paintings displaying a truer depiction of the land and environment. There are many paintings from the time depicting snow scenes, although before this there were few paintings depicting winters as cold and snowy (Burroughs 1981). Once such is Hunters in the Snow, a well known painting by Pieter Bruegel the Elder (Bruegel 1565) (Figure 2.1). It has become one of the iconic images of the cold period known climatically as the Little Ice Age (Robinson 2005). The image shows hunters returning to a village where mountains are covered in snow and ice, and lakes lower down in the village are frozen and people are walking on them. The image depicts a very cold period under grey skies and frozen ground underfoot, in fact Lamb (1967) suggests that the picture was a response to the 1565, one of Europe's worst winters.

Paintings were also made of frost fairs which were held on the River Thames. The first official record of such a fair is 1608, but they probably happened many years before that date. At the frost fair during the winter of 1683-1684 a printer by the name of Croom

sold souvenir cards, embossed with the customers name, date and the fact that the card was printed on the Thames. One might think of this as the first type of 'wish you were here' postcard, which instead of being posted would be shown to friends at every opportunity, describing how the weather was during the owners excursion onto the frozen Thames; an early weather report.

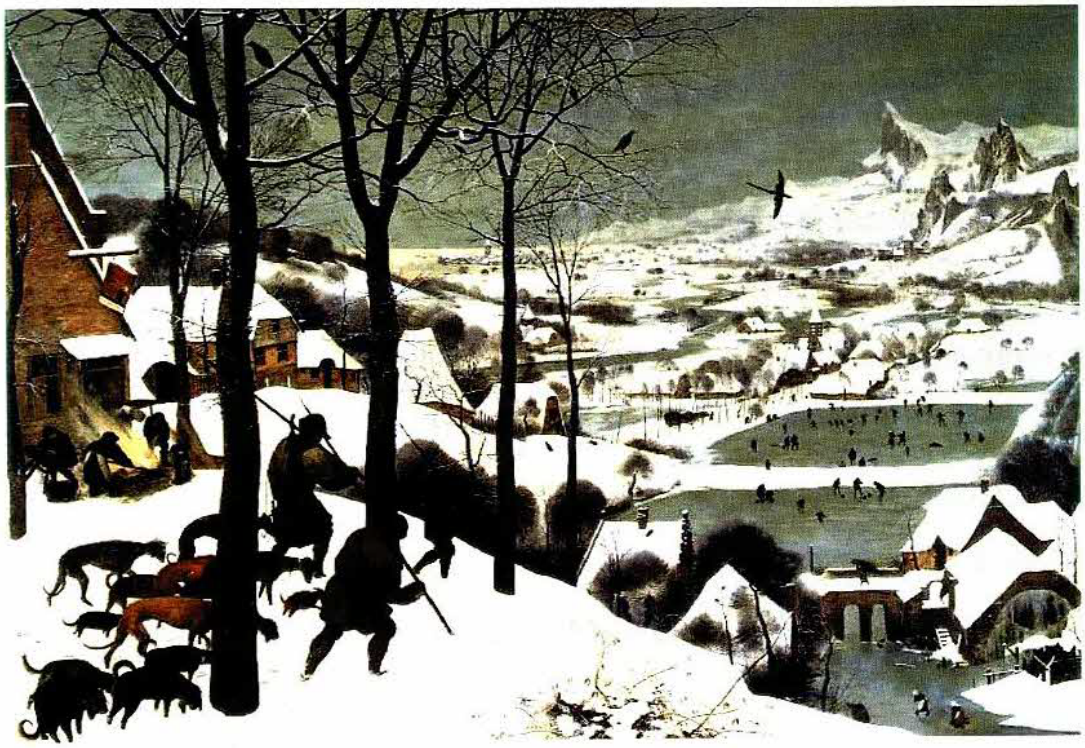


Figure 2.1 Hunters in the Snow by Pieter Bruegel (Bruegel 1565) the Elder has become one of the iconic images on the Little Ice Age.

Of course many artists have depicted the weather in landscape paintings and for the purposes of this thesis the works of John Constable and J.M.W. Turner are considered.

Thornes & Metherell (2003) discuss how Turner can be described as a realist whilst Constable is a naturalist. There is a subtle distinction between these two styles of painting. 'Realists', according to Baudelaire "*want to represent things as they are, or as they would be, supposing that I (the perceiving subject) did not exist*" (quoted in Rubin 1996. Page 53). Thornes & Metherell further explain that, *"Realists could therefore paint their own vision of*

nature, although their observations were rarely impartial and the movement became closely associated with wide socio-political views."

Therefore one must not expect that the atmosphere depicted by Turner is a true representation of conditions at the time the subject was painted. Turner would have used his own impressions of how the atmosphere may appear to elaborate or enhance the dramatic impact of his paintings.

Conversely naturalism conveys the atmosphere in a true state. Thornes & Metherell (2003) state that, *"Naturalism refers to any work of art that depicts actual rather than imaginary or exaggerated subject matter."* It is in the paintings of Constable that we see the work of perhaps the greatest of the weather painters. Some have surmised that his depiction of the sky and nature were so good because Constable believed that it was in nature that God's will was most clearly revealed (Clark 1949).

For the purposes of this thesis it is interesting to focus on the emotions that the depiction of weather and atmosphere have on the human mind. By their very nature, the works reflect the fact that emotions can be stirred either by true depiction, or inferred interpretation of conditions.

When looking at an image of the atmosphere as representied in a painting, we are looking at conditions on a particularly day, or over a series of days, at some time in the past. Thornes (1999) states that not only does Constable represent past weather in his painting's, he represents present and future weather conditions too. Compare this to viewing symbols or contours in a television weather forecast, where one views predictions of how the atmosphere may be depicted in the day (or days) ahead. By including the atmosphere in their work, Turner and Constable must have known that emotions would have been stirred in the viewer. Is this what those who design television weather forecast graphics should also try to achieve? It is the author's opinion that graphic designers should seek an emotional response from the viewer when viewing graphical interpretations of future conditions.

However, it is possible to take the works of Constable further in comparing it to television weather forecast graphics. Thornes (2007) discusses how Constable wanted to know how the atmosphere worked. Indeed the artist himself stated that *"We see nothing truly till we understand it."* (Constable 1836). This then raises the question of whether the television viewer should understand *why* a particular weather event is occurring rather than witnessing the phenomena as an icon on a weather chart, or as a statement made by a presenter. If a viewer understands a phenomena then they are better equipped to watch for the signs of it's onset (such as cumulus clouds building ahead of showers) and adapt to its consequences (taking shelter).

During the surveys conducted in Chapters 5 and 6 comments are sought from respondents as to their suggestions for improvements in television weather forecasts. The most frequent suggestion was that frontal charts should be displayed on forecasts, contrary to the findings of the BBC focus group detailed in Chapter 1. It has been argued that most viewers do not understand frontal charts and so they should not be included in the forecast. However, others have argued that by showing such charts viewers can be educated as to how the weather works, and why phenomena are forecast to occur; a view with which Constable is likely to have agreed.

But, as discussed earlier, it is the emotions raised by paintings and symbolic representations of weather which link the paintings of great artists to the television weather forecasts of today. Compare the two pictures shown below and assess how one might feel when viewing such pictures. "A Storm of the Coast, Brighton" shown in Figure 2.2 is dominated by grey colours and broad brush strokes awaking in the viewer images on rain and windy weather, wrapping up against the elements and a feeling of autumnal rains.

Figure 2.3, "Flatford Mill" consists of brighter colours. Bright, white cumulus clouds set again rich blue tones of a summer sky. One feels happy and warm when looking at the picture. However, one must be careful in assuming that this is high-summer. The shadow of

the horse in the foreground is quite long, perhaps indicating later summer conditions (the trees are in full leaf, with the deep green chlorophyll infusion shown by leaves nearing the end of their useful life to the parent tree).

It should also not be assumed that the weather is going to be fine. The building cumulus clouds are indicative of an unstable, polar maritime air mass which frequently produces heavy, sometimes thundery showers. Nevertheless the picture does feel warm and makes one feel 'good'.

Should television weather forecasts also be able to evoke such feelings in television viewers, and if they were too stir emotions, would they be more memorable? Perhaps television weather forecast graphic designers should pursue this statement as it may influence their designs for future weather graphic display systems.

In more recent times the artist Olafur Eliasson has attempted to engage people with the weather by creating large scale exhibitions which explore the relationship humans have with the weather. Eliasson's exhibition takes the culture of weather beyond the mental emotions created by viewing images, and adds physical sensation into the concoction.

Hosted at the Tate Modern Gallery, London from 16th October 2003 to 21st March 2004, "The Weather Project" created a giant representation of the sun and sky in the Turbine Hall of the Gallery. A giant sun was at the far end of the gallery with a fine mist injected into the Hall to create the ambience of being 'within' the weather. Eliasson *"views the weather... as one of the few fundamental encounters that can still be experienced in the city"* (Eliasson 2003). Eliasson also discusses how a city 'mediates' the weather. He considers that television weather forecasts represent 'hyper-mediation', the viewer is having to imagine conditions and is not actually experiencing them. However, a more tangible mediation may be the experience of getting wet whilst out walking on a rainy day. Between the two extremes may be sitting inside and watching the weather through a window.

Figure 2.2 "A Storm off the Coast, Brighton 1824" by John Constable (Constable 1824). From a private collection and printed courtesy of Salander-O'Reilly Galleries. The dour skies evoke feelings of gloom and dampness.

Figure 2.3 "Flatford Mill ('Scene on a Navigable River') 1816-1817" by John Constable (Constable 1816). The picture evokes a happy emotion within the viewer.

Of course, modifying indoor environments is something that humans have been engaged with since the earliest times. Neanderthals would have lit fires in order to increase the temperature of their dwellings. The Romans introduced more sophisticated central heating systems, the temperatures of which could be crudely controlled. Modern central heating can be regulated to the nearest degree Celsius, or should the weather be too hot outside, air conditioning units can be installed to reduce temperature, making indoor conditions more acceptable.

The atmosphere can also be 'brought inside' on a larger scale. Holiday complexes such as Center Parcs (Center Parcs 2007) boast that *"The subtropical environment is maintained at a blissful 29.5C, it's summer all year round"*.

By creating a physical connection to the weather, our experience is intensified. Television weather forecasts should try to stimulate these feelings. However, the only way to achieve this is through graphical representation of the weather, and through communication skills of the presenters. Perhaps by perfecting such goals one can emulate the physical realities of and emotions of The Weather Project and/or Center Parcs, whether those emotions are negative or positive.

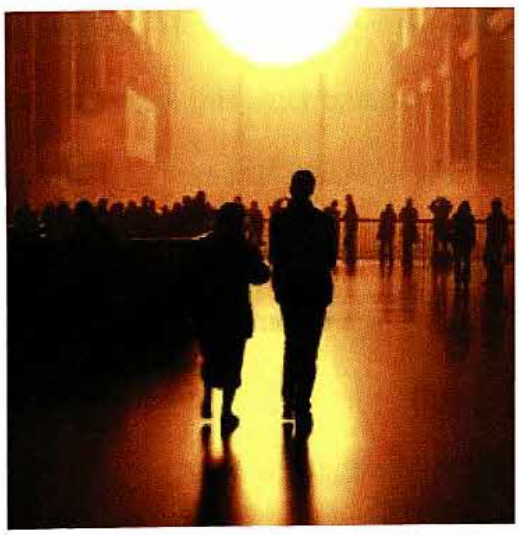


Figure 2.4 The artist *Eliasson* has expanded the culture of weather beyond the mental emotions stimulated by viewing images, and introduced physical stimulation.

2.4 Newspapers

Acta Diurna, (Daily Acts), sometimes referred to as the Daily Public Records, is regarded as the earliest recorded newspaper. From around 59 B.C. Julius Caesar wanted to inform the public about important forthcoming meetings and ordered that white boards be displayed in cities, such as Bath, publicising such events.

Newspapers then evolved slowly as printing techniques improved and eventually the newspaper became the first regularly, mass produced method of disseminating weather information. Readers who bought newspapers would read about the weather in a text format and then visualise the weather in their minds. Regular weather reports were printed in newspapers from 1842. Daily weather maps were first produced and distributed for public consumption at the Great Exhibition of 1851. These maps showed an outline of the British Isles with weather reports from around the country. The reports were plotted onto the map which was then printed and sold at the Exhibition for one penny. For the first time the general public were able to visualise the weather as it occurred, simultaneously in different parts of the country. Gone was the need to read text and then perform a visualisation of conditions.

However, it should be noted that a form of weather shorthand visualisation had been used by mariners for some time. In 1779 Alexander Dalrymple (Dalrymple 1779) suggested a form of shorthand to describe wind speed, this latter being copied (apart from the insertion of a 'moderate breeze') by Admiral Beaufort in 1806; who also appended a list of letters depicting various weather phenomena. Beaufort's contribution to meteorology and the conveyance of the meteorological message is discussed more widely in Nicholas Courtney's book, 'Gale Force 10' (Courtney 2002).

On 1st April 1875 the first weather map was publish in The Times (Figure 2.5). It was prepared by the now much neglected meteorologist Sir Francis Galton. He realised the problem associated with printing long-lists of reports and then problems of visualising such

data. In a paper published in the Philosophical Magazine Galton states *"When contemporary meteorological reports from numerous stations are printed one after another in a column (such as we may see in newspapers and certain foreign publications), they present no picture to the reader's mind."*(Galton 1861a). Galton continued to write about the necessity for the depiction of weather information in a visual format and suggested ways of presenting such information (Galton 1861b), including using varying shadings to present such data. Galton also produced charts showing icons of present weather conditions (see Figure 2.6). Eventually the daily weather map became a feature of all newspapers.

As time has progressed newspapers across the world have adapted various methods of presenting weather information and today newspapers vary considerably in the information they portray. For example, in the British Isles, The Sun prints a very small map with 30 words of weather, whilst the Times carries almost a whole page of weather information which includes synoptic charts and icon maps. It is not known if newspapers have carried out research as to what depth of information readers require from forecasts; none is publicly available.

Newspapers which portray more detailed forecast information and maps generally display forecast maps with symbols overlaid onto them. These charts are easy to view and to understand.

Over recent years the internet has become a threat to newspapers. The availability of news via the internet, most of it free of charge has caused newspapers to look inward and reassess their financial models as well as the service they offer to readers.

In a conference presentation in 2005 Timothy Balding, director general of the World Association of Newspapers reported a 32% increase in newspaper websites viewers during the preceding 12-months and a 350% increase over the past 5-years (BBC 2005). At the same conference speakers referred to newspapers becoming complacent and warned that "...free papers, online sites and the spread of blogs...would put growing pressure on the

readership of traditional newspapers."

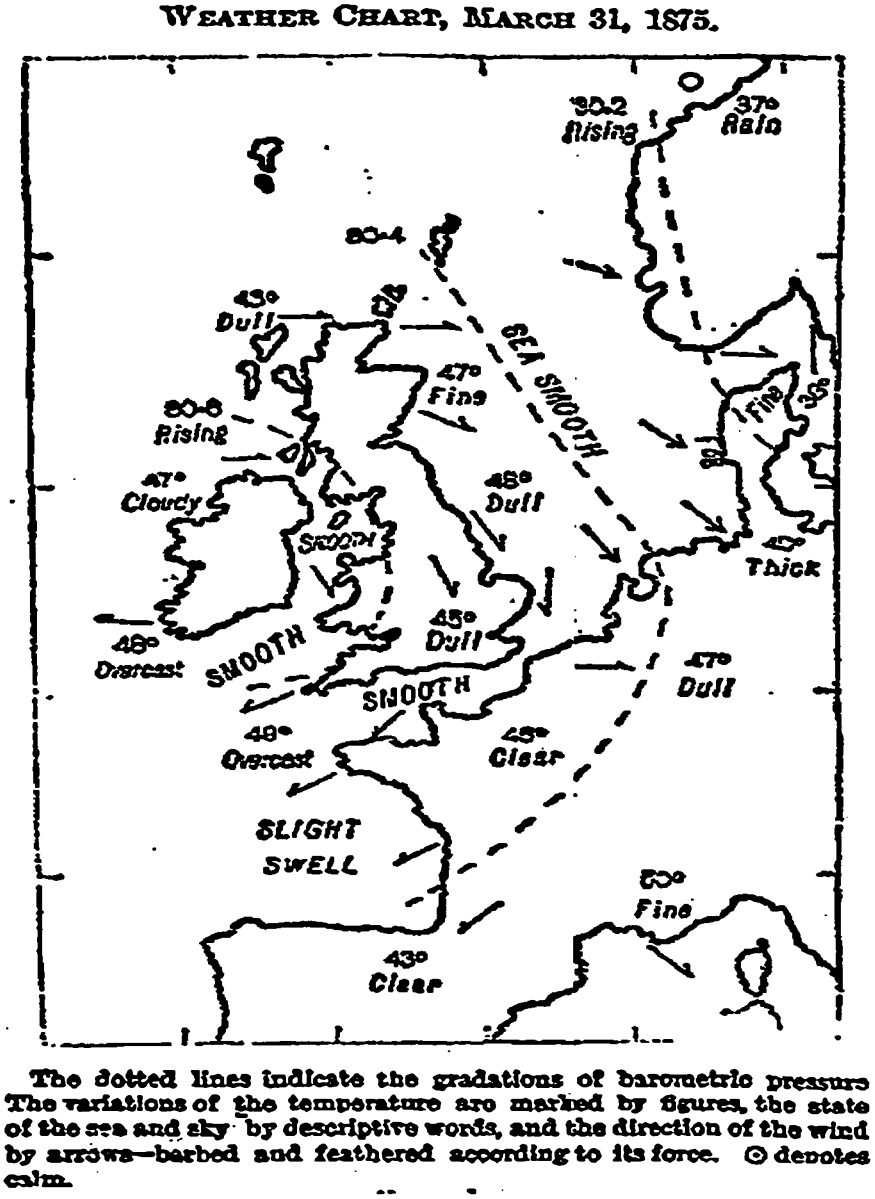


Figure 2.5 The first daily weather chart drawn by Sir. Francis Galton (Galton 1875) and printed in The Times newspaper 1st April 1875, depicting the weather situation of the previous day.

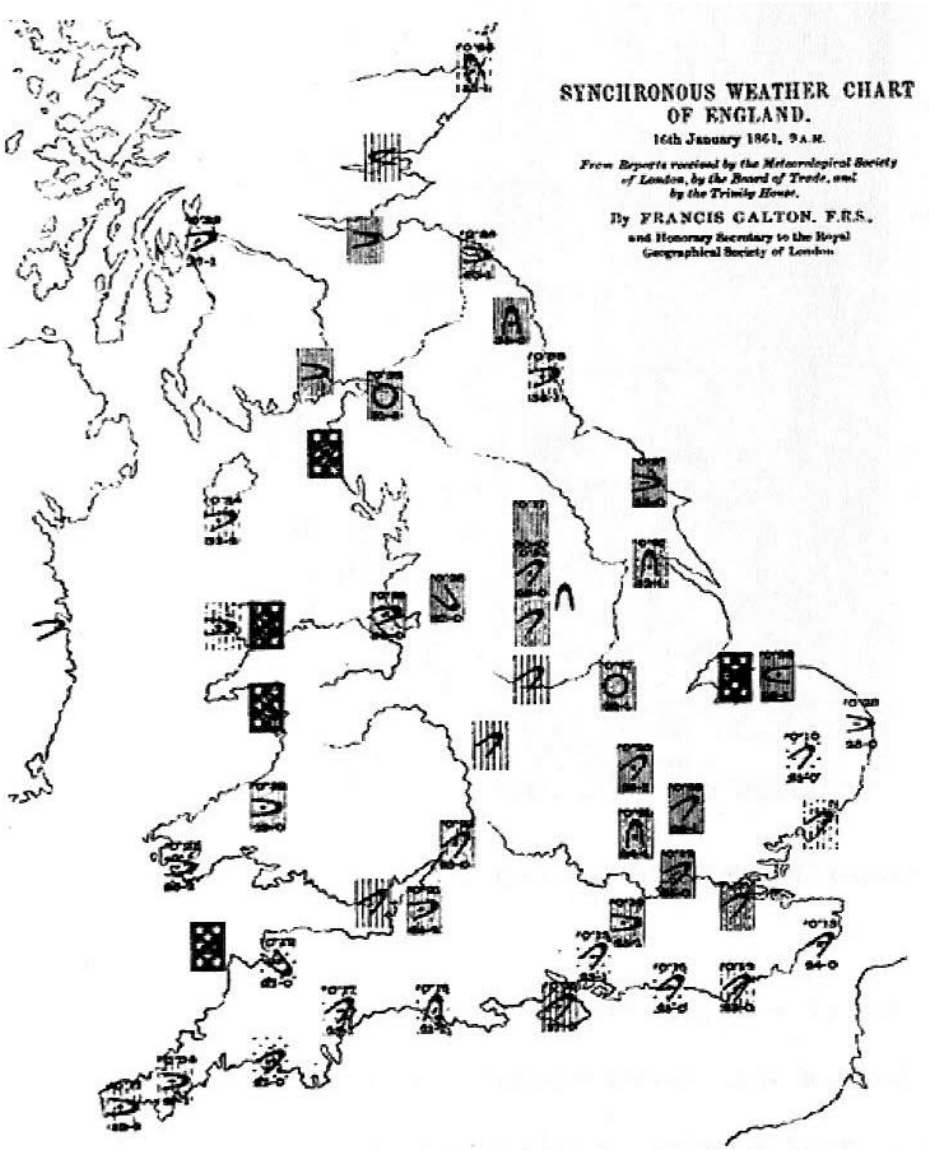


Figure 2.6 A weather chart for 16th January 1861 drawn by Sir. Francis Galton showing present weather icons from weather reports collected by telegraph.

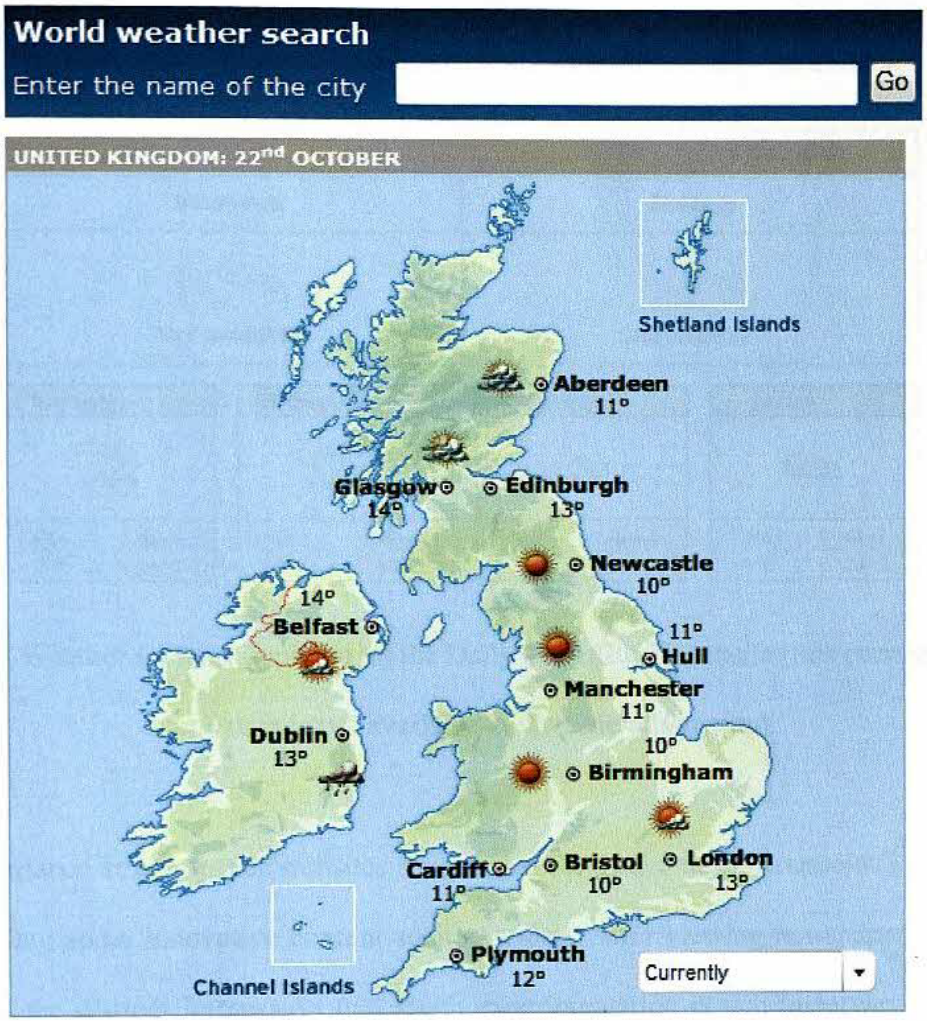


Figure 2.7 Weather forecast depicted on the Daily Telegraph (2008) website.

However, newspapers editors have been embracing new technology, and acknowledge that this is necessary for the newspaper industry to be sustained. Fabrice Rousselot is the internet editor of a French newspaper, Libération. In her opinion the internet is not a problem for newspapers, but is actually part of the solution (Reid 2006). She further argues that the internet should be an integral part of a newspapers business model, but says that the content of the website should not be the same as that which is on offer in the newspaper.

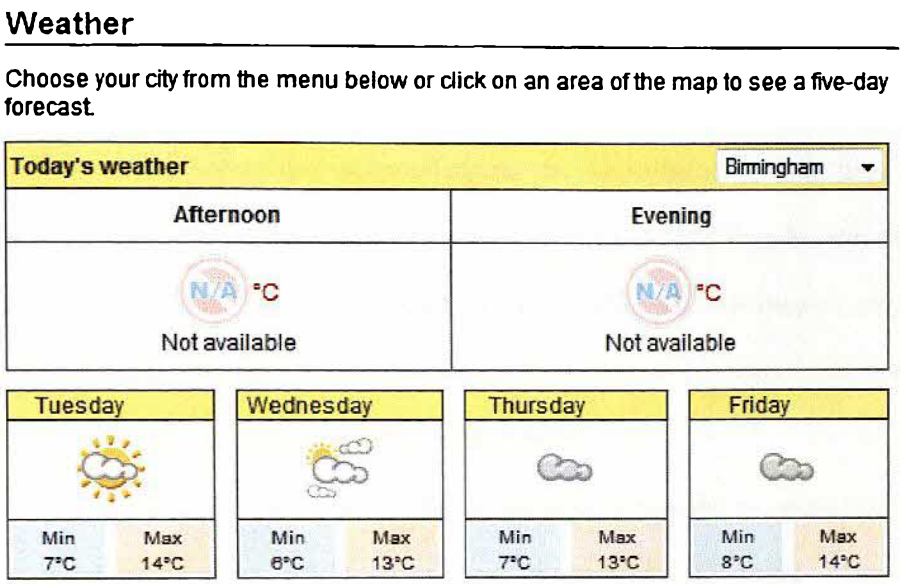


Figure 2.8 Weather forecast depicted on the Daily Mail (2007) website (this even shows that some data is not available at the time of viewing).

A glance at newspaper websites reveals that they have taken Rousselot's advice and are providing some innovative content such as video. After viewing newspaper web sites, one forms the distinct impression that much experimentation is still underway within the industry to establish what readers/viewers want to see.

The internet enables newspapers to advance the depiction of weather forecasts and to display forecasts in an innovative format. Unfortunately, many of them have chosen not to do this and to portray the forecast in the same way as in newspapers and many other internet weather sites. Static maps, often of neutral colours depict non-animating icons as can be seen in the websites of the Daily Telegraph and Daily Mail (Figure 2.7 & 2.8). The Times (Figure 2.9) contains a more complete weather forecast, as indeed do The Guardian, The Daily Telegraph and The Independent. Some daily newspapers depict no weather forecast information at all and have removed reference to the weather from their websites.

This is a surprising development given that weather websites are some of the most popular on the internet. Alexa.com is an internet traffic rankings site and places the most

popular weather website, Weather.com as the 199th most viewed website.

However, the most popular website is Yahoo.com and this site has weather as an option to view on it's homepage, acknowledging the importance of weather content on websites. The research carried out amongst the Weather Aware and Weather Passive groups in Chapters 5 and 6 reveal that they already view weather via websites as much as via television and that this demand is likely to grow. Newspapers are therefore not providing information which website viewers might expect to see.

Locality of weather forecasts may be of interest to viewers of newspaper websites and so regional newspapers could carry more regionalised forecasts. Many regional newspapers are specific to larger towns, and so presented video forecasts which are town specific may be of interest to website viewers and could attract sponsorship.

National Forecast

OVERVIEW

Rain in the northwest, otherwise dry, bright or sunny intervals.

TODAY:

England and Wales, bright spells but cloudier than recently. Generally dry but a little rain in the northwest and near southeastern coasts of England. Scotland and Northern Ireland, bright in eastern Scotland but mostly cloudy, occasional rain or drizzle.

TONIGHT:

Clearing skies across many parts allowing patchy mist and a rural ground frost. Cloud and brisk breezes will keep it milder further northwest where spots of drizzle are likely.

TUESDAY:

For most, a dry day with a good deal of sunshine after any early mist or fog clears. Low cloud and drizzle may linger in the far northwest, though.

General Situation

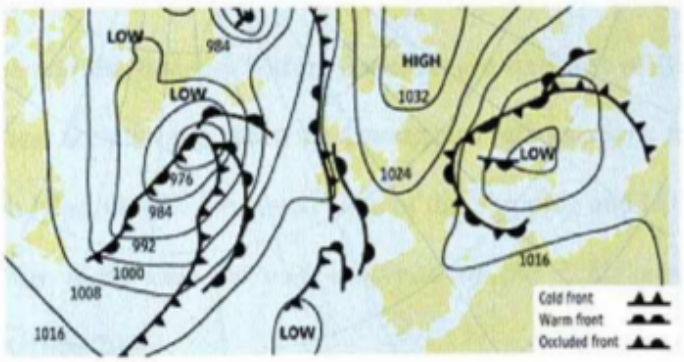


Figure 2.9 Times Online (2008) Weather Forecast revealing that forecasts are depicted similarly online as in traditional newspapers.

2.5 Radio

Radio stations cannot present weather forecasts as an image. They are restricted to verbal forecasts. Many radio stations use a simple 'rip and read' method where the forecast is issued by a weather forecast provider, such as the U.K. Meteorological Office, and this is then read by a radio news presenter or programme announcer. The listener must then

understand the weather story the presenter is trying to convey. Visualisation has taken place, but only in the mind of the listener. The amount and clarity of the visualisation will be dependent upon the clarity of the forecast as written by the forecasters and subsequently read by the radio presenter.

Some radio stations employ a dedicated meteorologist who will usually present a more detailed weather forecast. Often the meteorologist will have more time to present the forecast and will therefore convey a more descriptive forecast.

By using a meteorologist to present the forecast, and having the situation described more fully, it is believed by the radio station that a listener will better understand the forecast. This is probably through better visualisation of conditions.

More specialised forecasts for shipping are also broadcast via the radio. The Shipping Forecast and the Inshore Waters forecasts are stalwarts of BBC Radio 4. Selected areas of the forecast are also broadcast by Coastguard radio stations from various locations around the British Isles. One of the stated aims of the Shipping and Inshore Waters forecasts is, *"...to reach as many and as wide-a-spread of the U.K. population as possible"* (Meteorological Office 2006).

Radio stations now also have internet sites which contain weather forecasts. Visitors can therefore 'view' such information in a pictorial form as on other internet sites, and no longer have to rely on the radio announcers reading the forecast and the listener then mentally visualising it. The web forecast usually takes the form of a static, icon forecast of what weather conditions are likely to be or a map based icon map, similar to those which may be viewed in newspapers (see Figure 2.10).

However, further developments to radio websites do seem inevitable, probably including the addition of some video content displaying weather forecasts.

Figure 2.10 Many local and national radio stations now carry weather forecasts as part of the content of their web sites. The above is from BRMB (2008), based in the Midlands.

2.6 Television

The worlds first televised weather chart was broadcast by the BBC on 11th November 1936. This was part of a trial which, due to the onset of the Second World War was suspended until July 1949. The first "in-vision" British television weather forecast was broadcast on January 11th 1954; thirty-two years after the BBC had broadcast the first radio weather forecast.

In the USA television weather forecasting was on air prior to 1949. In 1948 a weather forecaster called Louis Allen was well known for combining clear delivery styles with educating the public (Henson 1990). The first nationwide televised weather forecast in the USA was made by John Clinto Youle on NBC in 1949.

Figure 2.11 The first BBC television weather forecast was broadcast on 11th January 1954.

Television is the main medium through which forecasts are viewed. Television stations use a variety of mediums to portray forecast information. These may be icons, for example showing a sunshine symbol, or contours, for example showing an area which may be affected by rain.

Broadcasts are available to view on standard television sets. New technology is changing viewing habits and increasingly weather forecasts are viewable through other methods such as via a desktop computer or downloaded onto a mobile mp4 player.

Often forecast data is displayed on maps of the area of interest. Before assessing the weather forecast for the area they are interested in, the viewer must be able to ascertain where on the map they are located; as revealed in the survey carried out by Thornes (1992); this is something which the public are not generally able to do with confidence. It does seem that an attempt to pinpoint one's location to within a general area can be made, but more detailed identification of the location is more difficult.

During the past few years television weather forecast graphics have evolved. When television weather forecasts were first broadcast, the forecaster would often draw expected conditions directly onto a map using a pen. In the 1970's the BBC introduced magnetic symbols which 'stuck' to a base map as the forecaster described the changed weather. These symbols are perhaps now the most well known of weather symbols. They are still in use

today via the BBC website (Figure 2.12).

Figure 2.12 Weather symbols introduced by the BBC in the 1970's are probably still the most well known of weather symbols. (BBC 2007).

Today, many types of weather symbols are broadcast, although they all follow a similar theme. During the 1990's various artistic depictions of weather phenomena were under experimentation by the author whilst working in private sector weather companies. Such cultural symbols involved showing umbrellas to signify rainfall, and ice creams to show warm weather during the summer. These new depiction methods were not successful as it was deemed that the viewer could not easily assess what the weather might be from only a short glance at each of these more descriptive symbols.

The interpretation and visualisation of the television weather forecast is discussed further in Chapter 3.

2.7 Conclusion

The television weather forecast is merely the latest incarnation of the depiction of weather information. By visually conveying such information it is hoped that the viewer has a better understanding of the weather that is likely to affect their area of interest, and can visualise how the weather may be.

Increasingly radio, which by its very nature is unable to broadcast image data, is using web sites to display weather information via the internet. This enhances the radio stations service to viewers and provides a continuous strand ensuring that not only does the listener tune to that station when no visual means of display are available (i.e. in the car),

but that they can also 'watch' the station when close to an internet connection (i.e. home computer). Radio stations can then claim to enhance value to advertisers by maintaining listeners (or viewers) for longer.

But prior to radio, newspapers provided the first mass produced and distributed method of weather depiction. With millions of copies still printed daily, the weather forecast in newspapers provides such visual weather information to the present time. Again the internet is playing a role here as many newspapers include weather on their web pages. Increasingly newspapers will depend upon the link between the printed and electronic form in order to enhance reader loyalty to the brand.

However, it was art that provided the first impression of weather as a visual study with the first true representations of weather appearing in the 15th Century. As the weather became less benign, artists began to depict the complexities and variability of the atmosphere. Turner and Constable are well known for their depiction of the skies both through impressionism and realism. Exhibitions are still being held conveying the physical apparitions of weather such as Elliason's recent "Weather project".

Visualisation of the weather is continually evolving. It evokes emotions in the viewer whether through art, newspaper, website or television. The following chapters explore how television stations assist viewers in the visualisation of weather forecasts, and seek to establish what viewers see and hear when watching such broadcasts.

CHAPTER 3:

INTERPRETING THE TELEVISION WEATHER FORECAST IMAGE

3.1 Introduction

Weather forecasts occupy primary broadcast times on television stations in the British Isles. Television stations acknowledge the importance of television weather forecast in their schedules with research showing that viewers use television as their main source of weather forecasts and that these most satisfy their needs (BBC 2004:1).

Weather, when included in other aspects of programming is remembered by viewers. Newman (1976) attempted to identify viewer's motivation for watching television news programmes. He questioned whether education had an influence on the level of recall amongst viewers.

Having surveyed 232 viewers shortly after a news bulletin, viewers were, on average, able to recall 1.2 stories unaided (i.e. without prompting by those carrying out the interviews). Interestingly, the stories which exhibited the highest level of recall amongst viewers were weather and human interest stories. The study found that education had very little influence on the pattern of recall amongst viewers.

The notion of "recall" presents significant challenges to those commissioning, designing and presenting television weather forecasts. There is no point in presenting a forecast if viewers do not want to watch, or do not recall the information presented.

Television stations will have differing reasons for it being important for a viewer to watch a weather forecast. For example, for a commercial television station, revenue is necessary in order to return profits to shareholders. The production of a television weather forecast is a costly business, contract prices range from ~£50,000 to ~£200,000 per year (personal correspondence), and therefore commercial television companies expect to realise at least a return equal to this expenditure.

ITV national weather forecasts have, since 1989 (Powergen 2005), been sponsored by the electricity generating and distribution company Powergen. Their synergy with weather is that the television forecast is part of everyday life. Does association with the forecast help them to promote the "greener" aspects of their energy production?

Powergen are not the only company to sponsor television weather forecasts. In the Midlands ITV region, weather forecasts are sponsored by B.M.I. Baby Plc who operate aircraft from the main regional airports at Birmingham and East Midlands. Various companies sponsor the weather forecast in other ITV regions as well as providing Channel 5 with sponsorship.

A company sponsoring an event or broadcast expects returns at least equal, but preferably in excess of the expenditure spent on the sponsorship. These returns may not only be financial they could also be beneficial in terms of customer relations and perception of the company.

So the television weather forecast is a marketable product, but could this marketability be improved if the forecast presented to the viewer contained the information, and graphical content that they wish to see? Will the viewer then watch one television station in preference to another in order to view the forecast which most satisfies their needs?

3.2 The Television Weather Forecast as 'art'

In order to answer the questions posed in 1.2 (and other questions raised throughout this thesis) it is necessary to look at the images portrayed in the television weather forecast, and try to view the forecast as a piece of representative (or even realist) art.

Thornes (2004) discusses how there how geography has undergone a "visual turn" and that this process has "accelerated since the beginning of the twenty-first century". As

the television weather forecast sits comfortably within the realm of geography, such a claim is an interesting one to explore.

Gregory (2000:18) proposes an equation for the defining physical geography:

$$\text{Physical geography} = f(P,M)dt$$

Here f = function of, P = process, M = material and dt represents changes over time.

More interestingly Gregory defines various levels of understanding, ranging from Level 1 (studying the components of the equation) to Level 4 (applying the equation). Thornes proposes a Level 5 addition which he defines as "appreciating/visualising the equation over time and space".

By applying these levels to a television weather forecast, which is probably the most graphical of presentations shown on television, Thornes philosophises that we may ascertain the quality of a particular weather forecast over another by deconstructing such images over time. However, do the graphical aesthetics of an image relate to a weather forecast's accuracy and can the two be linked?

The accuracy of forecasts is an issue which is debated daily at all levels of society, from pubs and clubs to the offices of international power traders, but perhaps accuracy is not as important as may be surmised. Is there a perception of accuracy in weather forecasts that is applied regardless of reality of accuracy data figures? Anecdotal evidence suggests that there is a tendency for users to believe that forecasts are of much the same quality and how a forecast looks is more important than the accuracy of the information.

For example, the thesis author operates a company called Weather School which provides weather training to pilots and sailors. During discussion with delegates, both pilots and sailors state that one of the dangers they have to be aware of when perusing various weather forecasts, is that they keep searching until they find a forecast that, a) looks attractive graphically and b) forecasts the best weather conditions for their purpose. Images alone can therefore be dangerous if not accompanied by some explanation of their meaning,

but it is these images which are key to understanding what the viewer 'sees' when watching a television forecast.

It would therefore be useful to look objectively at the images used during television weather forecasts and be able to break down images into their constituent parts. By doing so an image could then be assessed in terms of its ability to communicate the necessary information, it's relevance to the audience it is designed for and its overall effectiveness in achieving these goals.

3.3 Deconstructing the Television Weather Forecast Image

Conveniently Rose (2001) presents a model for the deconstruction of an image (Figure 3.1) and identifies three distinct sites within each image; the Site of Production, the Site of Audiencing and the Site of the Image Itself. Within each of the sites are three modalities referred to as the Technological Modality, Compositional Modality and Social Modality. Each of these sites can be identified within a television weather forecast, as will be discussed below.

The sites and modalities do not have strictly defined boundaries and can overlap and therefore Rose's model provides a useful template for the investigation of the television weather forecast fro a range of perspectives.

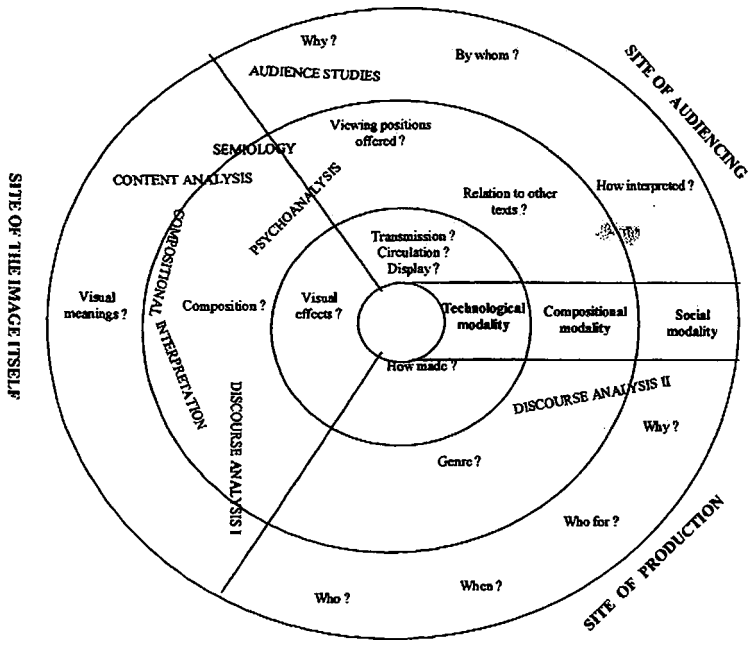


Figure 3.1 "Sites, Modalities & Methods for Interpreting Visual Materials", (taken from Rose 2005).

3.3.1 The Site of Production

Rose states that *"all images are made in one way or another, and the circumstances of their production may contribute to the effect they have."*

This statement applies to television weather forecast imagery. Rose's first modality within the Site of Production is that of the technological. The technology employed in the production of television weather graphics has advanced rapidly. For example, the BBC uses a Windows based PC computer system, together with proprietary software. This provides real-time rendering of images ready for instant on-air transmission. Compare this to only ten years ago when the author was creating weather graphics that had to be created on bespoke and expensive computers (such as Silicon Graphics machines). It took many hours to create forecast graphics and such equipment cost tens of thousands of pounds taking many hours to make a single bulletin. Now, using relatively inexpensive personal computer systems

broadcasters can produce weather graphics suitable for broadcast at a fraction of the cost of the previous stand-alone systems.

For the purposes of this chapter the BBC weather graphics system is used as a case study. The BBC introduced a controversial new method of displaying weather graphics in 2005, abolishing the traditional weather symbols and replacing them with contours. 'Controversial' is not an understatement of the reaction to the introduction of the new graphics. Letters published in *Weather* magazine highlight the hostility and subsequent discussions which took place. Examples of the comments carried in the Letters page (Royal Meteorological Society 2005) of Weather, the monthly journal of the Royal Meteorological Society include:

"...a very theatrical dizzy rush around the country, imposed on us with I suspect minimal audience research."

"...irregular formless images that are rendered pretty meaningless when divorced from the related pressure systems and fronts."

"The level of detail shown...is often well beyond what is forecast."

"How nice that the BBC weather forecasts are finally addressing the requirements of the under-fives."

"...the colour adopted is a big mistake."

"RIP BBC TV weather forecasts"

"The presenters used to educate the viewer as to the significance of high and low pressure areas."

Questions were also raised in Parliament (House of Commons, 2005). These comments have now receded in official publications, but anecdotal evidence suggests there is still some controversy surrounding their implementation. Surveys undertaken for this thesis asked respondents whether they preferred contour charts to more traditional symbolic representations of the weather. The results of these surveys are shown in Chapter 6.

As the prime example of a television station taking a radical approach to weather graphics, and facing the wrath of viewers because of this approach, the BBC weather graphics are ideal for further study. However, it should be noted other, equally suitable graphics systems are produced by various private companies.

Model data for input into the graphical system is provided by the U.K. Meteorological Office to the BBC's computer servers at the BBC Weather Centre. The BBC Duty Forecaster will amend the model in order to enhance it's appearance to television viewers and to include the latest meteorological data. This model is then available to all national and regional BBC presenters. Although the basis of the forecasts is created by the Chief Forecaster at the U.K. Meteorological Office in consultation with the BBC Duty Forecaster, regional presenters can amend temperature and wind graphics. Should rainfall or cloud depiction need to be refined this can be achieved after discussion with the Duty Forecaster (see Figure 3.2).

The proprietary graphical software used by the BBC is supplied by Metra Information (part of the New Zealand national weather service). Weather data and graphics are rendered in real time, allowing graphics to be altered seconds before being broadcast.

An advantage of computer graphics is that hues and tones can be altered in order to make them more visually appealing to viewers. However, at times the graphics can look rather flat and when lots of information is displayed they can be confusing. When designing graphics, be they for weather, sport, news or any other programme, the target audience will also influence the map projection and colouring of the graphics. Rosenblum (1993 page 12) states *"Will the audience consist of college researchers (knowing the data [to be presented] and the context) or other scientists with less information about the background or context...An audience with no scientific background in the data needs a simple presentation, one they can understand quickly, easily and intuitively."*

Model guidance from UKMO models – Global and NAE.

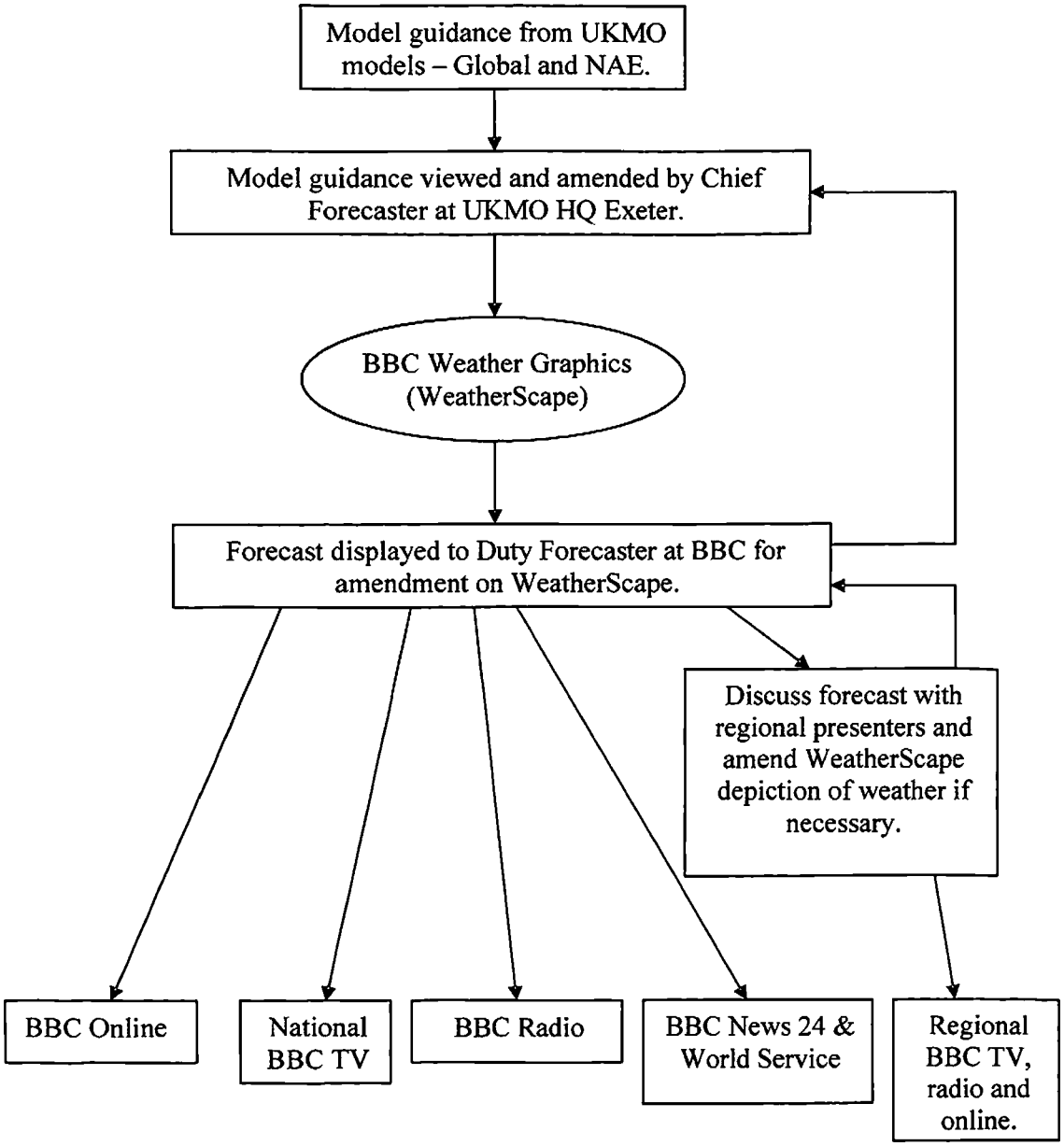


Figure 3.2 Flowchart depicting the forecasting process used by BBC Weather.

Rosenblum implies that the type of user will have an influence on the way data is presented. For example those of a scientific background may require more specific information than the lay audience. People who watch television weather will be from a broad spectrum of society. These may include someone wanting to know whether it will rain as they walk the dog or take part in a hobby such as cycling, or they may want more specific information such as pilots and sailors.

The genre, falling within the compositional modality of the site of production, can fit within the broad title of "television weather graphics". This genre of computer produced weather graphics is now over twenty years old with the first widespread use of television weather graphics being introduced by the BBC in 1984. Prior to this date symbols were magnetic, being placed onto boards by the forecaster as they presented the weather bulletin.

All television stations within the British Isles now use computer generated weather graphics. Until 2005 weather symbols were depicted on BBC weather charts and were well recognised by viewers. In May 2005 the BBC abolished the use of weather symbols and began using contours to depict cloud, rainfall and sunshine.

It is not only television where technology is changing the way images are viewed. Ahlstrom & Friedman-Berg (2006) explores how visual displays capture the viewers' attention. Aircraft movement displays have enhanced how air traffic controllers view aircraft in-flight. Controllers can now overlay live prevailing weather conditions onto their display screens display and assess how the weather will affect the aircraft under their control.

But has this increased the performance of controllers and the safety of aircraft? Initially, one may expect that this has produced positive results by enabling controllers to identify future weather threats to flights and routing aircraft around such hazards making flights more comfortable for passengers. As extra data gets added to displays, controllers will have to undertake more cognitive functions. This could mean that in busier times

controllers become overwhelmed by the data presented to them on screen, resulting in a reduction in their performance and increasing risks to passenger comfort and, ultimately, flight safety.

The third modality within the Site of Production is that of the Social. By looking for whom the graphics are produced one can alter the graphical emphasis accordingly.

A television weather forecast viewer will watch a forecast for differing reasons. These include the mundane, such as knowing whether to hang out washing, to the serious such as assisting in economic or physical survival of a business or leisure group (i.e. farmers, sailors, pilots and others)

Weather forecasts, as seen on television, are written for certain groups of interested viewers or are issued with the general population in mind. For example, farmers are interested in early morning forecasts which concentrate on wind speeds and rain for the day ahead, whilst evening bulletins place greater emphasis on the weather of the next few days.

Linked to the social modality is also the source of the forecast. With the private and public sector both active in producing weather forecasts, it can be ascertained that public organisations such as the U.K. Meteorological Office will have a greater obligation to produce forecasts for general society. This obligation is recognised officially as the Public Weather Service (PWS). It is the role of the PWS to provide *"a coherent range of weather information and weather-related warnings that enable the UK public to make informed decisions in their day-to-day activities"* (Meteorological Office 2008). This does not specifically extend to television weather forecasts, although BBC and ITV weather forecasts are included by the U.K. Meteorological Office in a report entitled 'The Public Weather Service's Contribution to the UK Economy' (Meteorological Office 2008).

This raises some concerns in the private weather sector, which has been struggling to grow since the first private weather companies were created in the United Kingdom in the 1960's. The report cites many examples of the U.K. Meteorological Office providing

weather services, the majority of which could be provided by the private sector. This in turn exposes the U.K. Meteorological Office to claims that it is operating in an anti-competitive manner, and is pushing the boundary of its Public Weather Service obligations.

Having stated the above the private weather sector in the United Kingdom continues to survive and does supply forecasts to commercial television in the United Kingdom. These include Sky Television and S4C (Channel 4 in Wales).

Regardless of where the weather forecast information is produced, the forecast provides a benefit to Society and sits comfortably within Rose's social modality.

Vining *et al.* (1984) presents the results of a survey of 255 farmers in Texas, U.S.A. The survey tried to assess how useful agricultural weather information was to farmers and to gather information as to whether farmers would be willing to pay for weather information.

The results of the survey amongst farmers showed that they regarded television as the most important method of gaining weather information; although it should be remembered that at the time this survey was completed the internet was not in general use. The weather parameter of most use was listed as the soil water content, closely followed by soil temperature. Of course, these are specialised parameters and if they were to be used on general television would be considered an inadequate use of the limited time available for a forecast bulletin. It is therefore incumbent upon the forecaster/presenter to decide who will be watching their forecast and provide information accordingly.

Questions a forecaster should ask when preparing a weather bulletin include:

- Why am I writing this forecast?
- Who will be watching?
- When will the forecast be broadcast?

If such questions are answered it may be that viewers are more likely to be satisfied by the information they receive. The methods used to display the forecast information also aide

the understanding of the weather story with viewers becoming familiar with a particular style of visual presentation.

For several years the BBC had been aware that their weather graphics were in need of updating. In 2004 a competitive tender process was begun in which the BBC invited interested companies to submit proposals for providing an updated weather graphics system.

The penetration of satellite and cable television, as well as the increasing availability of broadband internet connections (ONS 2006a), and the use of third-generation mobile telephones, presented a new multi-platform environment which the BBC was aware that it needed to exploit (internal communication). Weather technology was also advancing rapidly and computing power now made real-time rendering of on-screen graphics possible using relatively inexpensive equipment.

The exploitation of powerful weather databases enables more complex data to be displayed on-screen as well as allowing forecasters to amend and quality control the data exported from such databases. Abrams (2004) states that *"...many people and processes must work together...to create accurate, timely and consistent forecasts."* This statement is backed by Glahn (2005) in an article in which he discusses how the National Digital Forecast Database (NDFD) works in the United States National Weather Service (Figure 3.3).

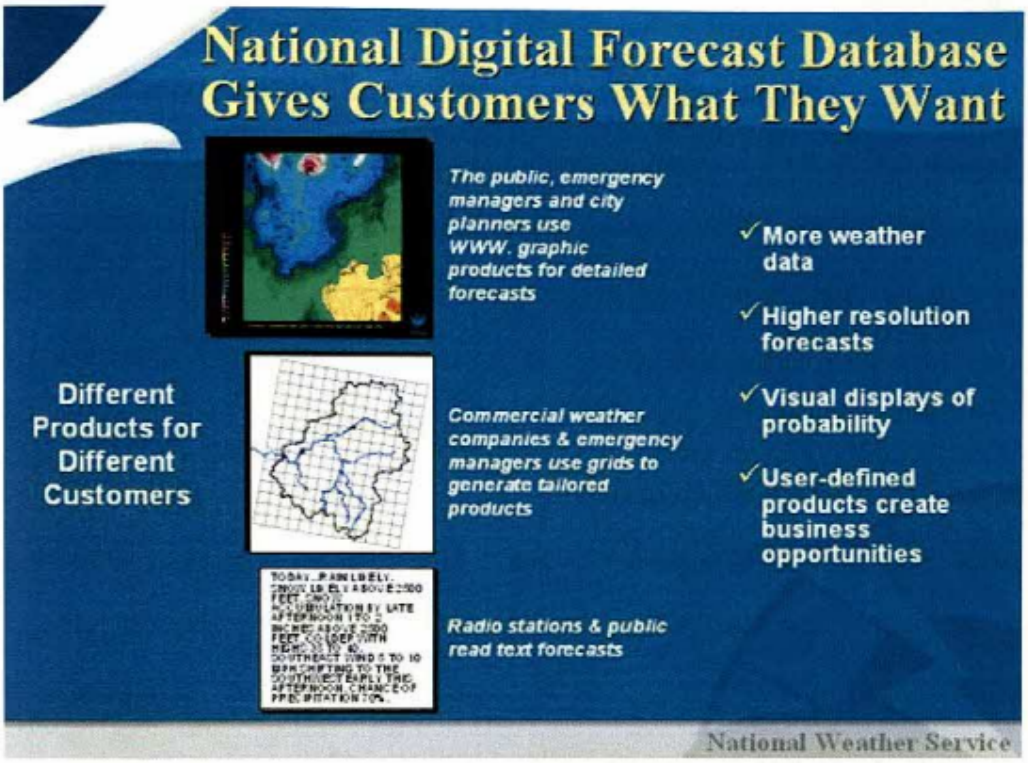


Figure 3.3 National Digital Forecast Database(NFFD 2008) – an example of technology being used to deliver more weather information to the public.

The NDFD is a gridded forecast system which digitally produces forecasts for towns and cities in the United States. Not only will the system produce spot forecasts it will also create textual products for towns, cities and regions. The NDFD is not rigorously automated and forecasters at NWS (National Weather Service) field offices can intervene and amend forecasts if necessary.

It is acknowledged by Glahn that the production of the NDFD forecasts is a time consuming process. This is one of the major drawbacks of human-intervened database forecast systems. The author has knowledge of an early system used by The Weather Network (UK) Ltd in the mid-1990's (The Weather Network was the United Kingdoms first 24-hour television weather channel). This system involved the production of automated forecasts created by Weather Services International (WSI) Ltd. WSI supplied forecasts for towns around the United Kingdom and Europe for six-hourly time intervals, out to several

days ahead. The forecasts required heavy intervention by forecasters and this proved to be a time consuming exercise. Only by an improvement in the accuracy of the model used to produce the forecast was the amount of intervention required by a forecaster reduced.

This improvement in model accuracy produced another benefit. Local forecasts were able to be produced in a textual format and transmitted via local cable companies as a 'text crawler'. This enabled highly localised forecasts to be transmitted in the lower quarter of a television screen, overlaid on a regional, national or international forecast.

However, one should not assume that human intervention is not now required. Substantial corrections are applied to model data received by the BBC and private sector weather forecasting organisations such as Weather Consultancy Services (personal communication).

A similar system of transmitted localised forecasts to viewers was developed in the early 1980's during the inception of The Weather Channel in the United States of America. Frank Batten, the founder, Chairman and C.E.O. of The Weather Channels, describes this system known as WeatherSTAR (Batten & Cruickshank 2002). This was the first system to be able to overlay such localised forecasts, having received the information from the U.S. National Weather Service, and set the standard for future incarnations of the technology.

WeatherSTAR brought local forecasts directly into the viewers' home truly enhancing the social aspect of weather forecasts by making them directly relevant to the viewer.

START OF COMMERCIALLY SENSITIVE RESEARCH – NOT FOR INCLUSION IN PUBLIC COPY OF THESIS

Of course, there would be little point in developing a new method of displaying weather data if the audience did not require it. Therefore focus groups were assembled by a market research company on behalf of the BBC to explore how consumers use and feel about television weather forecasts. Previous internal research identified the under-45 age

group as needing to be attracted to the BBC, and so research was focused to this group whilst not alienating the core of BBC viewers who were in the higher social groups ABC1 and aged over 45 (Table 3.1).

Social grade	Social status	Occupation
A	Upper middle class	Higher managerial, administrative or professional
B	Middle class	Intermediate managerial, administrative or professional
C1	Lower middle class	Supervisory or clerical, junior managerial, administrative or professional
C2	Skilled working class	Skilled manual workers
D	Working class	Semi and unskilled manual workers
E	Those at lowest level of subsistence	State pensioners or widows (no other earner), casual or lowest grade workers

Table 3.1 National Readership Survey (NRS 2003) Social Grade Definition (U.K.).

The research discussed with groups how BBC forecasts compared to those transmitted by commercial television stations. This research is not within the scope of this thesis and so this section will concentrate on how the research was conducted and what the viewer perceptions of television weather forecasts revealed.

Viewers were placed into three categories, these were:

1. Time squeezed – half used BBC online, aged 25 to 44
2. News on TV – watched sky news/BBC News 24, aged 30-45
3. Serious News – watched BBC 6pm/10pm, some listened to Radio 4 and were aged 30-60

Groups were assembled and the research conducted in London, Bristol and Edinburgh. Individuals were asked to watch weather forecast each day and given a 'weather diary'. They were also shown clips and still frames of forecasts during focus group sessions.

The author has been granted access to this commercially sensitive and confidential research.

Overall it was found that each of the "news types" had broadly similar, yet limited, weather needs. The overriding requirement of the reports commissioners was to find out how the weather forecast affected individuals, and their families, in either their locality or the location where they were going.

One of the prime questions posed by viewers when watching a forecast was "is it going to rain?" The weekend was of particular interest, especially to men, although interestingly, for women the weather had a higher impact. Citing reasons such as dressing children, drying washing and the impact on their mood; this is discussed further in *Site of Audiencing* below.

When asked about new technologies and the impact it would have on how they watched television weather forecasts respondents said that they didn't see on-demand services (i.e. interactive satellite/cable) as replacing their viewing of the main television weather forecast in the future. Those who use the internet said that they were impressed by how specific the information is, particularly at a postcode level, although no statement of accuracy was given.

Regarding weather graphics, some criticised the graphics as slowing down the communication of the essential elements of the weather forecast. Others liked the "fly-over" technique used by some television stations. The concept of "diving beneath the clouds" had a particular appeal.

The survey also asked how peoples' use of forecast would differ through the day, and the information forecasts at different times should consist of. Unsurprisingly viewers

wanted the morning forecasts to be short and succinct in order to help plan the day ahead. The forecast should be very localised and simply provide information for the coming day. Specifics of the weather, i.e. will it be cold? Will it rain? ,were important, these forecasts being more likely to be watched by females.

Evening bulletins, it was suggested, should to be more structured and last for a lengthier period of time (although no bulletin lengths were suggested). Viewers wanted a forecast to help them plan for the next day, or the weekend when appropriate.

Rain and temperature as well as the amount of sun were important, as was the pollen count. A look at the weather around the whole of the United Kingdom was thought to be useful with viewers also mentioning a longer range forecast, possibly with a look at European weather to be included in a late night broadcast. Male and female were equally as likely to watch these forecasts.

As far as graphics were concerned viewers liked large maps. These, they felt, helped them to feel closer to the map and made their own area seem more significant. Towns should be marked on the maps, giving a reason for them to focus on their particular location. The viewers welcomed more "movement" in maps, i.e. fly-throughs. However, it was stressed that the graphics should complement the narration of the forecast and not compete against it for viewers' attention.

END OF COMMERCIALLY SENSITIVE INFORMATION

But is it possible to deliver the forecasts that the BBC focus groups required? No forecaster will state that they can predict the weather in co-located towns with an acceptable degree of accuracy. One of the requirements of the focus groups was that frontal and pressure charts were not shown. These charts can convey much information and as a forecaster the author would argue that these charts increase the viewers understanding of the forecast. Is this a case of viewers not being sufficiently educated in the use of the charts? It

is also interesting to note that this view is contradicted in the research carried out in Chapter's 5 and 6.

The first step in establishing if this is the case is the ability of the viewer to locate where they live; after all, if viewers cannot locate themselves, pressure and frontal charts as well as countrywide graphic charts become useless. In this case all that could be displayed would be a town name, followed by the forecast. Thornes (1992) interviewed 110 members of the public with a cross-section of ages, in one day. Asked to point out on a map where they were (York), only 57% of respondents were able to locate themselves within 45km of York. In this thesis a similar question was asked of 152 respondents (see Chapter 5). Asked to mark their present location on a map on the British Isles; just over 71% were able to locate themselves to within 40km.

If geographical location is an issue could this be addressed by education, but is television an effective method of doing this? Wagnet *et al* (2005) discuss how effective television can be in educating the public. This study cites a statement by the National Science Foundation (2000) which *"emphasises a need for increased citizen capacity in making good use of scientific data...Scientific understanding of the environment, together with an informed, scientific literate citizenry, are requisite to improved quality of life for generations to come."* (for full report see National Science Foundation (2000)).

Although Wagnet *et al.* (2005) was written to assess the usefulness of an organised environmental educational course, it found that the effectiveness of television as an environmental educational tool was not strongly supported. This study could not be directly transferred to the use of weather forecasts, but if one were trying to educate the public, in say, the use of Atlantic pressure and frontal charts, it may be that television is not the ideal medium to do this, or that television alone should not be used as the educational medium.

However the Wagnet *et al.* (2005) study was restricted to only one course, and it is unwise to extrapolate other determinates from it, such as assuming that television based

education will *always* be ineffective. The Open University has successfully used television as an educational method for many years, although this is in conjunction with other learning media. The first Open University broadcast was made on 3rd January 1971.

When designing graphics for use in professional fields, interaction from the user is now considered. It is possible to interact with television via "the red button" on remote controls used with digital television in the British Isles. Treinish (1999) discusses how technology has advanced sufficiently for the user need, rather than technological ability, to drive the design of graphics.

By using an operational weather forecast to demonstrate the principles of task-specific visualisation design. Treinish considers three steps for defining a visualisation task. These are that one must define the application in terms of a users needs, then compose design elements and interface actions to implement these definitions, and then establish different techniques for achieving the various user goals.

Although again not directly related to television weather forecasts, one could use similar thought processes for the design and implementation of television weather graphics. The viewer should be considered the interactor, with the following steps proposed for such design:

1. Define the weather graphics application by using carefully constructed questionnaires to ask viewers what they require from the application.
2. Create weather graphics and a presenting structure that will implement the requirements of the majority of viewers.
3. Develop various implementations of the graphics systems depending upon viewer user groups, i.e. farmers, sailors and so forth.

These techniques will only apply if the weather graphics system is to be interactive. Television stations have attempted a limited amount of weather forecast interaction via digital services. One can now press the "red" button to select a forecast to view. For example, Sky News provides United Kingdom or European graphical bulletins as well as the option to retrieve forecasts for towns and cities in a text format. It may also be possible using the red button to overlay one's location onto a map. This would allow the viewer to identify their area more quickly and therefore allow them to devote more cognitive power to watching and listening to the forecast.

And why not use the red button to feed actual weather conditions back into the forecast presentation. Wireless weather stations, conforming to acceptable standard are now available for a relatively modest outlay. Many people with a weather interest already have these at home. Such data from the stations could be fed back into the forecast system, allowing data from nearer to a viewer's location to be displayed and included in the forecast. This could be particularly useful if the service were to show real time weather observations in a 'crawler' across the bottom of the screen. Should the viewer be some distance from official weather stations, data from stations nearby could be overlaid on the crawler instead to portray a more local weather story to the viewer.

Feedback of weather data is already used in some commercial forecasting systems. Thornes (2008) discusses how actual observations from road weather sensors are fed back into forecasts in real time in order to assist road salting operations. Road engineers have access to both actual and forecast data, this information assisting them in making decisions about whether, where and how much, to salt roads in winter. Using a similar feedback system television forecast may be improved by providing the viewer with more local weather information and allowing them to assess how accurate a forecast is likely to be for their area.

3.3.2 The Site of Audiencing

Technology is also advancing rapidly in the transmission and display of television weather graphics. High definition television (HDTV) has been introduced enabling graphics to be depicted more sharply and in higher definition than previously.

Transmission techniques have also changed and are now achieved using tapeless transmission. Any forecasts that need to be recorded are done so digitally and broadcast in a similar way. The penetration of digital television into United Kingdom households is advancing rapidly. OFCOM (2005) reported that 69.4% of homes in the United Kingdom had a method of receiving digital television installed (Freeview or Sky). By the end of September 2007 OFCOM (OFCOM, 2007) were reporting an increase in penetration to 85.1%. The UK now has the highest digital television penetration (in percentage terms) of any country in the world.

New technology will further increase this figure and now television weather forecasts can be seen on mobile devices such as telephones and P.D.A.'s. The audience can therefore alter their location and continue to watch the same weather forecast.

Broadband internet access allows consumers to watch video and audio rich media content delivered via the internet. The quality of such broadcasts can be similar to that of standard television and as such the viewer unaware that the video was delivered in this way.

The penetration of broadband internet into United Kingdom households continues to increase OECD (2007), as does the penetration in other OECD countries. Figure 3.4 shows the net increase in household broadband penetration between the second quarter of 2006 and the second quarter of 2007. The United Kingdom is 13th in the list, although penetration increase is still above the average of all OECD countries. The most rapid increase during the preceding year was in Ireland, closely followed by Germany and Sweden; slowest growth was experienced by Mexico.

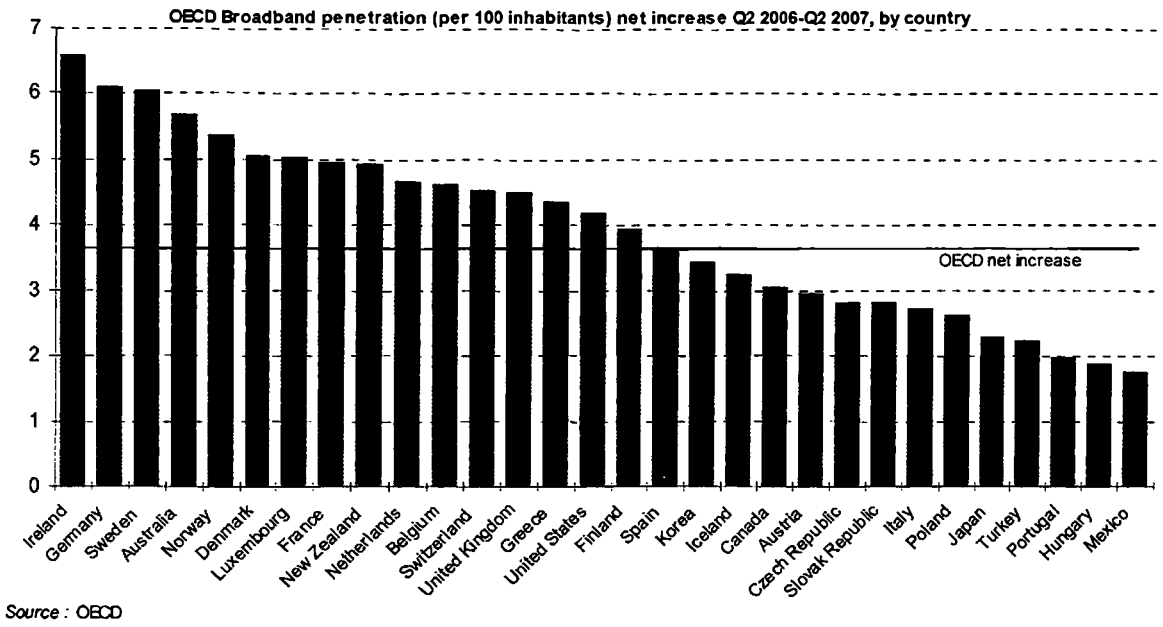


Figure 3.4 OECD Broadband Penetration (OECD 2007) (per 100 inhabitants) net increase between Q2 2006 and Q2 2007, by country

Socially the interpretation of the forecast image will be largely made depending upon the social setting in which the image is being received, for what purpose it is being viewed by the audience and why they are watching. Again using the example of the farmer; he will be keenly interested in how and when the weather may change. He may watch the frontal charts more closely than the viewer who only wants to know whether to take an umbrella to work.

As mentioned previously, the weather has an impact on viewers' moods and this in turn could have an impact on their state of mind when watching the forecast. The impact of weather on mood is a well recognised phenomenon. In a comprehensive study Howard & Hoffman (1984) related ten mood variables to eight weather variables in a comprehensive study. The mood variables used included concentration, co-operation, anxiety, aggression, depression and sleepiness. Weather variables of hours of sunshine, precipitation,

temperature, wind direction and velocity, humidity and change in atmospheric and absolute pressure had the greatest impact on mood.

Data showed that high levels of humidity resulted in lowering concentration levels, whilst increasing the levels of sleepiness. The authors concluded that humidity was the most significant predictor using statistical techniques of regression and canonical correlation analysis. By looking at how humidity affects moods the paper discusses the implications of the findings for the performance of employees in offices, and the performance of school pupils.

The weather does not only have an impact on our psychological health it impacts our physical health too as proven by various studies.

The weather can also have financial implications. Saunders (1993) compared the percentage of cloud cover each day at New York with stock price indexes on the New York Sock Exchange. This study revealed that the amount of cloud cover has an effect on the indices of the New York Stock Exchange, and that *"...investor psychology influences asset prices."*

The acceptance of the forecasts in various social settings also plays a part in the visual interpretation by the viewer of the forecast image. Different social settings will affect the viewers' interpretation of the image and perhaps their perception of the forecast. For example if being viewed in a pub the viewer may well pass comment to their friend that "forecasts are never right anyway"; why should this be? Is this distrust based on the graphics, presenter, perceived inaccuracies of previous forecasts or even a belief that the weather is unpredictable, or is such a controversial statement just something to say?

3.3.3 The Site of the Image Itself

The image itself is the third and final area where an images meaning is created. The visual effects of the forecast, animating contours or fly-through graphics show the

technology involved in producing such graphics. Forecast graphics are constantly evolving with a hope that the viewer will maintain interest in the image and that such images will be easier to interpret. However, this may not always be the case and there may be occasions when animation is not effective.

Ainsworth and Van Labeke (2004) investigate the effectiveness of the use of animation in training materials for a variety of "learners". The authors assume that learners may be from many fields and are undertaking some learning process involving visual materials.

The paper mentions how animation has been found to be effective in increasing a learners motivation (Rieber 1991) but presents mixed results as to whether animation aids the learner is actually understanding the dynamic phenomena presented. Ainsworth and Van Labeke (2004) also investigate why animations should place additional cognitive demands on learners. They cite Stenning (1998) as analysing animations from *"a perspective that emphasises the semantics and processing requirements of making inferences from representations"*. Stenning makes three observations with regards to the extra demands placed on learners by animations:

1. Information in animations is presented transiently, the learner must hold relevant previous states in memory and then integrate these with new knowledge.
2. An animation cannot be ambiguous with respect to time and this forces a presentation to be made in a particular sequence. This is more relevant outside of the meteorological field and so will not be further discussed here.
3. Users who do not have control of animations cannot re-access previous states or control the speed at which information is presented to them.

Of the above, points 1 and 3 are most relevant to television weather forecast viewers. When animations such as satellite sequences are presented to viewers, the previous picture must be held in a viewers' memory. This could lead to problems of recollection with a viewer not fully understanding the picture that has been presented to them. The role of the presenter is vital in conveying the relevant information pertaining to each animation sequence.

Viewers do not currently have the ability to replace animating sequences, or the speed at which the animations change. However, this may become possible in the future as digital television enables viewers to interact with the forecast using "red button" features.

The question of whether to animate graphics or not is one which has featured only limited discussion in literature. Even papers published in journals with no relation to meteorology often use weather charts during surveys as examples of how the user may see the charts. But what is "animation"? Betrancourt & Tversky (2000) define it as a *"series of frames so each frame appears as an alteration to the previous one".*

Bogacz & Trafton (2005) looked at how professional forecasters use images. They state that studies have found that animations do not necessarily improve performance and that static images impose a high workload on the human brain. The feeling within the literature and from the authors own experience of television stations, is that an animating image should be better than static images. The reason for this is that animations should be able to convey more information about the process of change over time.

In the Bogacz study weather forecasters were presented with a choice of what weather information they wanted to look at, and these were categorized as pictures, sequence, animation and text. Animation was unpopular with the forecasters making virtually no use of it. However, forecasters did look closely at the static pictures. The research also listened to what the forecasters said as they were looking at the data and found that they tend to think in a dynamical fashion. It seems that the advantage to be gained by

forecasters using animations is limited when the same information can be displayed using static images.

Bogacz *et al.* (2005) suggest that animations may increase cognitive workload and that forecasters animate static displays in their own mind. A process forecasters also undertake is that of blending various weather models. This is certainly a method with which the author can empathise. When on duty and presented with many forecast charts from several forecast models, the forecaster will look at these and mentally 'blend' the charts, deciding on what he thinks is the most reasonable solution. Obviously, this can only be achieve if the forecaster is sufficiently educated and experienced to be able to recognise patterns and produce an acceptable forecast outcome based on these charts.

Not only is it better for experts to extract dynamic information from static displays, but that is actually what they do on a regular basis. Most viewers will not have the experience of a meteorologist to be able to blend such images and view static displays in a similar way. What information is the viewer seeing?

Research by Lowe (2003) identifies that the preference for animation seems to be based on little more than the intuition of the designers and commissioners of graphical systems. It also notes that the instructional effects of animations are not always of benefit, and that there is a risk of an excessive amount of information placing to great a demand on the user. In the case of animations which provide specialised dynamic information, it may be that negative consequences occur as the demand on the user is too great.

Importantly Lowe lists three main types of change within an animation:

1. Form changes (transformation), such as size, shape and colour.
2. Position changes (translations), this is movement.
3. Inclusion changes (transitions), the appearance or disappearance of features.

Lowe carried out an earlier study (Lowe 1999) using written responses. The study was limited in terms of the amount of information recorded. The subjects were not required to make predictions based on the information they had seen and only limited information was recorded from the subjects. Therefore Lowe suggests that it may be better to get the subjects to respond directly by drawing their findings. This was achieved using a group of 12 undergraduate students and a further control group.

The subjects were given a weather map and asked to make a prediction based upon it. The first group were given animating predictions, and the second predicted without animation. Results from such tests are important as very often what appear to be rather insignificant changes on a meteorological map can actually depict major changes in the weather.

In the later study (Lowe 2005) subjects did indeed draw features of the meteorological pattern which were not necessarily the most relevant. The first four features drawn tended to be those in animation which had a distinctive appearance, with Lowe making particular reference to fronts. On a weather map fronts show as distinctive objects, being either solid triangles, semi-circles or both. Another feature noted by a subject was a heat low which remain virtually stationary throughout. Lowe states that this was noted as it remained stationary against a moving background.

Discussing his findings Lowe says that the extent to which components of an animation exhibited change appear to have a major influence on the extraction of information from the images. Information tended to be noticed when there was a large amount of dynamic contrast; Lowe states *"...[studies] seem to suggest components of animation attract attention because they a) change substantially more than their surroundings or, b) change substantially less than their surroundings."* This is particularly relevant when considering television graphics as a natural conclusion is that simply showing

animation does not necessarily mean that the most important information is being conveyed to the viewer.

For example, consider a pressure chart with a broad south-westerly flow through the British Isles, and a shallow low developing over Northern Ireland and running into northern England (Figure 3.5). It may be that the area of low pressure could bring some heavy rain, or even snow in the winter months. However, the main weather feature may be the high pressure building to the west, bringing dry and sunny conditions. Should the viewer only see the pressure chart with no further explanation they may conclude that high pressure will be the dominant feature, the low pressure insignificant, and consequently the weather will become more settled, ignoring the low bringing the heavy rain.

On the subject of retention of information, Lowe states that, *"Retention seemed more likely for aspects of the display extracted relatively easily."*

Once again this study focused on the educational qualities of an animation sequence, rather than studying specifically what information an independent viewer retained from watching such displays. Taking this into account it is still a useful study when considering the visual effects of the image within Rose's technological modality of the Site of the Image Itself.

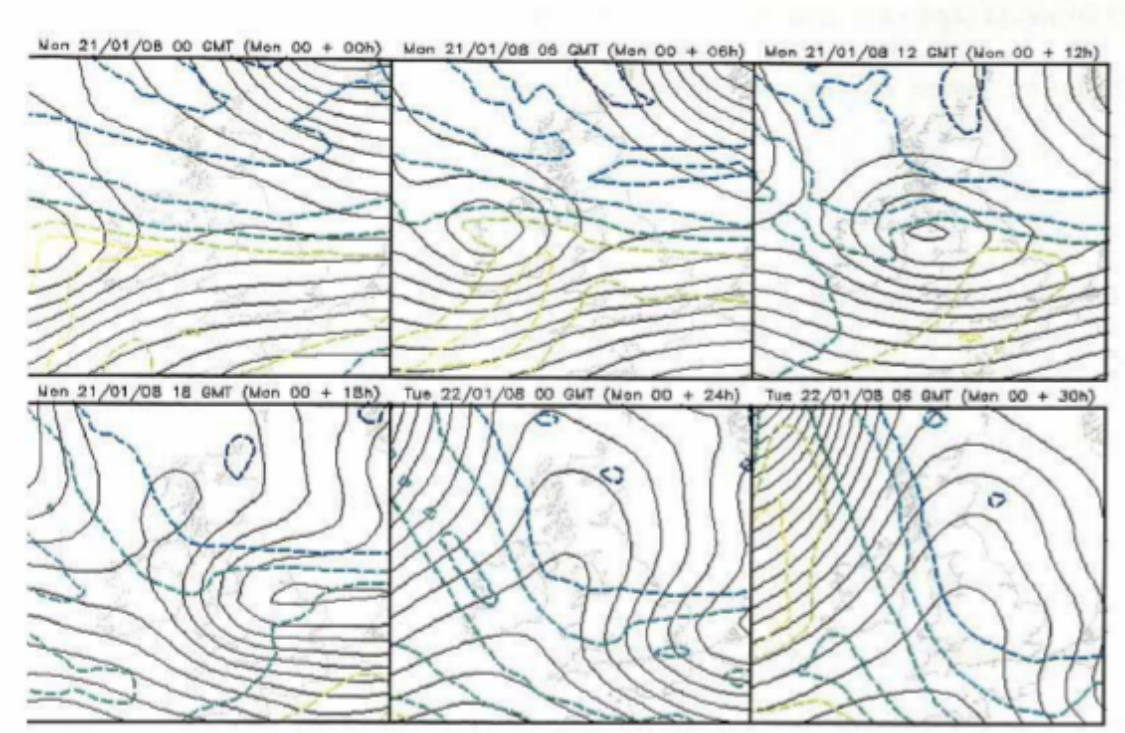


Figure 3.5 Chart sequence showing shallow low crossing northern England. This feature could bring heavy rain or snow, but may be missed by the viewer concentrating on the ridge of high pressure building from the west.

Ainsworth and Labeke (2004) described how they identify three types of animation for those who are undertaking learning:

1. Time Persistent – shows the relationship between the variable being shown, for example a pressure chart, by displaying both the variable and the current value, together with any further values that have been derived.
2. Time Implicit – this shows a range of values although not the time when these occurred. They contain less information overall than a time persistent animation form.

3. Time-Singular – displays one or more variables at a single instant of time. For example pressure, cloud and rainfall may be shown for one time frame.

In concluding their paper Ainsworth and Labeke state that, in the majority of simulations several forms of animation, as listed above, are shown simultaneously. This leads to an increase in cognitive tasks that a learner must complete. If this is the case for those who are learning, perhaps the same is true for viewers of television weather forecasts and they can also only cope with a limited amount of animation/time animation?

The composition of the image is important when considering how the viewer will interpret the forecast. Should too many weather parameters be overlaid on one map, viewers complain that maps are confusing (personal communication).

The visual meaning of forecast charts, culminating in the collective meaning of the forecast, shows how social awareness of weather information impacts what the viewer sees.

3.4 Conclusion

By using the Rose's model to deconstruct the weather forecast image one is encouraged to consider all the aspects of the forecast, in technological, social and visual terms. The models application to the television weather forecast is relevant as one can assess how each of the 'sites' interact and overlap producing the completed forecast.

However, the television weather forecast is a complex production which combines hard science, entertainment and the emotional nature of the audience, including the surrounding they are watching in and the social interactions taking place at the time of viewing. As such Rose's model does not present the complete 'recipe' of the television weather forecast, but it does go some way to help one appreciate its complexities.

This chapter has investigated the Rose model for the deconstruction of weather forecast images. This has been useful when investigating the interactions viewers have with the image and the overall techniques which may be employed both technically and psychologically to improve ones retention of forecast information.

CHAPTER 4:

A REVIEW AND CONTENT ANALYSIS OF SELECTED TELEVISION WEATHER BULLETINS BROADCAST IN THE UNITED KINGDOM

4.1 Introduction

National and regional television weather bulletins are broadcast many times a day in the British Isles. In order to assess the weather content of such bulletins a brief review has been undertaken. This review describes the content of the forecasts and the visual appearance of the graphics used. It also states whether the presenters have any meteorological training.

4.2 Methodology of the Review

There are vast arrays of television weather forecasts available to viewers throughout the day. Outlets for the forecasts have grown in number significantly over the past few years. Forecasts can now be viewed on traditional television sets, through digital television boxes and on-demand both via digital television and broadband internet connections.

For the purposes of this review only the weather forecasts shown on the main television channels in the United Kingdom are shown. The BBC is considered as a single entity as forecasts are similar across all platforms; BBC1, BBC2, BBC4, BBC World Service and BBC News 24. Channel 5, GMTV and S4C weather bulletins are not included in the review as they are considered to be minor players and may have distorted the overall findings.

For each of the broadcasts a breakdown of what each consists of is shown. This includes the time and length of transmission, the course of the data and a brief summary of the usual sequence of graphics shown. Finally a S.W.O.T. (Strengths, Weaknesses, Opportunities, Threats) analysis is undertaken for each of the broadcasts.

The review was conducted by watching random bulletins on the television channels at various times of the day on a single day in October 2006.

4.3 The Review

BBC1 National Bulletins

Broadcast times:

Morning 0615,0645,0715,0745,0815,0845

Afternoon & evening: 1327, 1827

Late evening: 2235 and between 0000 and 0200

Length of presentation: 1 minute to 2 minutes

The most watched television weather bulletins in the United Kingdom are those broadcast on BBC1. The presentation tend to follow a set sequence of graphics and are usually presented by a meteorologist, or a presenter who has undergone meteorological media training at the UK Meteorological Office Training College .

Broadcast sequence:

1. Opening titles – showing presenters name. The image within the spinning globe can be altered by the presenter to reflect the prevailing weather conditions.
2. Headline graphic – consisting of three or four words summarising the coming period, i.e. the morning, afternoon or night ahead, whichever is sooner.

3. a) Pressure chart – these may occasionally be shown if it is felt that they aid the forecaster in conveying the weather story. However, it is argued that most viewers do not understand isobars and weather fronts and so these are not shown every day.

b) Satellite picture or sequence – these are shown more often as it is believed that satellite pictures may be more easily understood by viewers in the short time that they are shown. Should nothing on the satellite be relevant, it will not be shown.

4 a) Forecast contour charts – the forecast charts are shown for the coming period. Charts are shown as a sequence of moving images, with rainfall indicated by blue "puddles". Heavier rain is shown by greener colours. Cloud is overlaid onto the forecast charts in the form of a shadowing effect. Where cloud is broken the land surface appears a brighter shade of brown, where cloud is thicker it is darker.

A typical evening bulletin will consist of a forecast for tonight, tomorrow and then a further static chart for the following day.

4 b) Temperature forecasts – shown within the main sequence are predicted temperatures for major cities of the UK. These temperatures are maximums, in the case of daytime predictions, or minimums for overnight predictions.

5. Outlook – forecasts for cities may be shown. These are for the next few days and reflect a collection of forecasts for cities around the UK. The cities change daily, depending upon weather conditions.

6. Closing titles – static end page reinforcing the globe branding. It shows the website and is referred to by the presenter.

BBC1 SWOT Analysis

Strengths:

- Bulletins have authority given by the BBC and U.K. Meteorological Office brand
- Forecasts transmitted nationally
- Financed through licence fee so able to pay for advanced graphics
- Dedicated Weather Centre enables latest data to be collated and broadcast on-air in the shortest time
- Weather forecast follows main news bulletins ensuring high viewing numbers.

Weaknesses:

- Forecasts national, details are broad for the whole of the country
- Being the 'national state broadcaster' limits scope for radical presentation
- When new graphics are tried, reaction is swift and often negative
- Broadcast restricted to data from the U.K. Meteorological Office being shown, other models might be better and the forecaster may prefer to change the forecast to follow these models more closely but cannot do so without guidance from Chief Forecaster at the U.K. Meteorological Office
- Presentation of cloud/sunshine difficult for some viewers to understand

Opportunities:

- Can respond quickly to new technologies such as 3G mobile telephone broadcasts

- Guaranteed revenue presents advantage over competitors who are not assured of income year on year
- Graphic companies keen to supply to the BBC as the kudos gained may help sell such software to other television stations
- Ability to undertake major consumer research and assess where the market might be developing and what viewers expect to see

Threats:

- May be affected by changes in government legislation which may alter terms and conditions of licence fee
- Competitors may produce more radical graphics, which could prove popular and attract viewers
- Dependency on meteorologists being U.K. Meteorological Office employees places a restriction on BBC's ability to impose it's own terms ,conditions and working practices
- Graphical software company may use the unique set-up of the BBC (supplying national and regional bulletins) to enhance and perfect software techniques this then being used by competitors
- Other media display forecasts such as radio, newspaper and the internet

As the public service broadcaster in the United Kingdom the BBC broadcasts to many millions of potential viewers. While this vast audience reach is an advantage it also presents problems especially in terms of the detail BBC weather broadcasts can include in forecasts. To some extent this is satisfied by BBC regional broadcasts, but even these can cover large geographical areas.

Audience emotions also play a major role in broadcasts made by the BBC. Tax payer funding enables the viewer to believe they should have a say in how BBC programmes are formatted. Changes to graphics or broadcast times are often resisted and this leads to a natural tendency for conservatism in weather broadcasts and less scope for radical styles of presentation.

However, such conservatism can also bring advantages by creating a stable framework of broadcast times and styles. The viewer becomes familiar with the service offered, and this is turn breeds loyalty to both the brand and product.

Data is provided solely by the U.K. Meteorological Office and although presenters may be meteorologists they still have to follow the briefings as given by the Chief Meteorologist. Independent forecasting organisations do not have this restriction and can view output from various models. Such restrictions on forecast interpretation can lead to presenters not giving a viewpoint as to likely develops, somewhat sanitising the broadcast, especially when a number of whether scenarios are likely.

ITV1 National Bulletins

Broadcast times:

Morning: 0628, 0658, 0728, 0758 ,0828, 1135

Afternoon & evening: 1355, 1855

Late evening: 2255

Length of presentation: 30 seconds to 1 minute

Following a flexible framework of graphics, ITV weather is presented mostly by presenters who have undergone meteorological training at the UK Meteorological Office, or more infrequently, by meteorologists.

Broadcast sequence:

1. Opening titles – showing presenters name and a brief summary
2. Forecast symbolic chart – Showing weather forecasts for the whole of the UK and Ireland. Temperatures are also shown, as are wind directions.
3. Outlook charts – Brief outlook showing symbols and temperatures.

ITV1 SWOT Analysis

Strengths:

- Forecasts have authority given by U.K. Meteorological Office branding
- New designs can be tried, not as protected as BBC
- Flexibility of scheduling allows forecasts to be shown at peak time providing maximum value to sponsors
- Public probably expect less of ITV-Weather

Weaknesses:

- More tabloid presentation style less authoritative than BBC
- Flexibility of scheduling means that audience may not know when the forecast will be shown
- Sponsorship of forecast reducing time available for forecast to be shown
- Forecast may cease at anytime with withdrawal of sponsorship
- Graphics are rather primitive

Opportunities:

- Ability to react swiftly to requirements of customers should a change in forecast format be required

- Can interact with regional bulletins to give complete national and regional weather scenario
- Time of forecast can be altered to coincide with most view programmes, increasing viewers and adding more value for sponsors

Threats:

- BBC could amend bulletins to compete directly, broadcasting at the same time as ITV1
- Legislation could be passed restricting the sponsorship of weather forecasts
- Viewer demographics may not be compatible with those who watch weather forecasts and therefore viewers may not watch the forecast
- Sponsors may decide to withdraw budget and therefore forecasts would be produced at a loss whilst an alternative sponsor was sought
- Other media display forecasts such as radio, newspaper and the internet

As a national broadcaster ITV is restricted, as is the BBC, in the amount of detail it can give during its weather bulletins. Once again, similar to the BBC, regional ITV companies can provide more detail, although still covering relatively large geographical regions.

Data is provided to ITV by the U.K. Meteorological Office and therefore forecasts are very similar, or the same as those give broadcast via the BBC. Whilst this may be seen as advantageous during periods of severe weather (both national television stations carrying the same warnings), it does restrict viewer choice. Instead of a viewer measuring forecasts on the basis of which perform best for their region, they are forced to judge a broadcast by its presentational style and graphical content.

As a commercial broadcaster ITV does have the ability to change broadcast times and graphics and could, if they chose to do so, be more radical and experimental with forecast

styles and graphics. At the present time ITV remain conservative in their approach to weather broadcasting, seeming to imitate BBC broadcast graphics, although a little innovation could produce some interesting results.

Innovation such as this for ITV could lead to enhanced viewing figures and therefore the ability to command more revenue from sponsors.

Channel 4 Bulletins

Broadcast times:

Morning: No bulletins

Afternoon & evening: 1225, 1930

Late evening: No bulletins

Length of presentation: 30 seconds

Channel 4 weather bulletins are read from a script by newsreaders. Graphics are shown full frame.

Broadcast sequence:

1. Satellite picture – showing an image of the near Atlantic around the coasts of the British Isles and Ireland. The image zooms into the UK and then "through the clouds" to reveal a symbol chart.
2. Forecast symbolic chart – a map of the British Isles and Ireland showing weather, wind and temperature symbols. The maps follow a sequence of tonight, and tomorrow.
3. Outlook – two maps of the British Isles and

Ireland containing an outlook for the following two days. The maps show wind, weather and temperature symbols.

Channel 4 SWOT Analysis

Strengths:

- None presented bulletin enables more of map to be seen
- Bulletins following news allows viewers to know when the forecast will be shown without having to refer to TV schedules
- Short bulletin times keep information to the point and concise
- Bulletins are cost effective to produce as no additional presenters required

Weaknesses

- None presented bulletins can seem unfriendly and detached from viewers
- Short bulletin time may mean that important information is omitted or the forecast for a viewers area is not given
- Graphics can appear dated and inexpensive which does not build confidence in the forecast
- As forecast is read by a non-meteorologist any meteorological errors in the script would not be spotted, or the nuances of the forecast script not acknowledged

Opportunities

- Bulletin lengths could be extended to give more detailed forecasts
- Presenters could be employed to enhance the forecast
- Sponsorship of the bulletin could raise additional finance to employ presenters and improved graphics

Threats:

- Competitors bulletins are presented, often by meteorologists who can interpret the weather story more effectively
- Other commercial television companies, such as ITV, compete for their bulletins to be sponsored
- Other media display forecasts such as radio, newspaper and the internet
- Channel 4 may decide to stop funding the forecasts

Channel 4 have chosen a different approach to their broadcast style; instead of using dedicated weather presenters the duty newsreader records the bulletin, providing a basic service. The potential for expansion of the Channel 4 weather service is significant.

As non-presented the forecast does not build trust among viewers and the appearance of the graphics is very simple and appears dated. By upgrading graphics and having a weather presenter either voice-over or present the forecast in-vision Channel 4 would enhance the quality of the service significantly and significantly increase its appeal to sponsors.

Out of the forecast studied in this review Channel 4 presents the greatest opportunity for an enhanced weather service and the introduction of innovative styles of graphics and presentation.

Sky News

Broadcast times:

Morning: Bulletins throughout the morning

Afternoon & evening: Bulletins throughout the afternoon and evening

Late evening: Bulletins throughout the evening to 2300.

Length of presentation: 30 seconds to 2 minutes

Sky News weather bulletins are presented by presenters who have received some weather training. There are also presenters who are meteorologists. Sky News forecasts are similar to those broadcast by the BBC in the level of detail offered and the frequency of the forecasts.

Broadcast sequence:

1. Satellite picture – usually a European satellite sequence.
2. Radar and satellite sequence – UK and Ireland, Pictures seem not to be enhanced and are the "true" versions of the UK radar output. Animations are shown as a quick sequence containing several hours of data.

3. Forecast cloud & rainfall charts – forecast charts are shown for the coming hours, although the exact length shown seems to be dependent on the amount of time available. The random sample forecast for this thesis was taken in the afternoon, this bulletin predicted the weather for the following two periods, i.e. this afternoon and tonight. Simulated cloud is shown, as is rain and drizzle, depicted by darker shading to the cloud.

3 a) Temperature forecasts – shown for selected cities in the UK and Ireland. The temperatures shown reflect the forecast period, i.e. maximum temperatures for daytime periods, minimum temperatures for overnight periods.

Sky News SWOT Analysis

Strengths:

- Frequently broadcast forecasts
- Broadcast across Europe via Sky
- Forecasts available on internet and interactively via the 'red button'.
- Well established and recognised lead presenter, Francis Wilson

Weaknesses:

- Only available via Sky and internet, not on terrestrial television
- Times of broadcast can change, certain times with non-presented forecast
- Source of forecasts not acknowledge
- Despite minor redesign of graphics, forecasts have remained essentially the same for many years

Opportunities:

- Presented forecasts could be available throughout 24-hours
- Redesign of graphics may attract more viewers
- Frequency of forecast updates could be used to promote Sky News as being up-to-date

Threats:

- Companies may decide not to sponsor the forecast
- Key presenter may decide to leave
- Other media display forecasts such as radio, newspaper and the internet
- Commercial television companies competing for sponsorship of forecasts

Broadcasting internationally restricts the detail which can be employed by presenters during Sky weather bulletins. Sky has no regional network of television stations and

therefore can only broadcast national forecasts for the United Kingdom and Ireland. This can also present advantages in that the live nature of the forecasts sometimes enables longer bulletins and more detail to be placed in these bulletins than is included on the BBC, ITV or Channel 4.

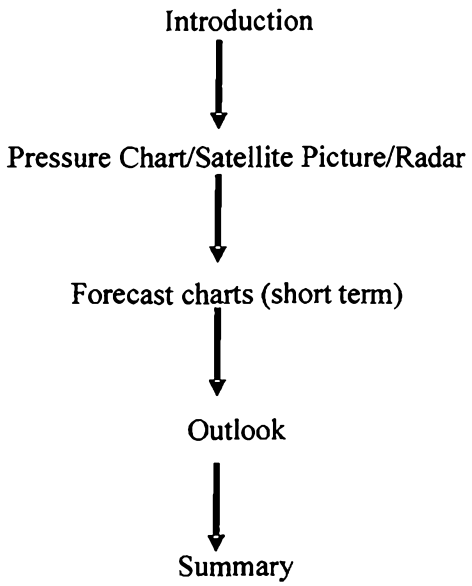
As the key presenter, Francis Wilson is a recognised figure and branding for Sky News Weather. His departure from the company could lead to a significant reduction in viewer loyalty and therefore Sky should look to enhance the profile of its other weather presenters.

Sky does offer a broadcast that looks different to the other national broadcasters. Symbols are not used during the forecasts, and innovations have been tested, such as showing forecast satellite images during the early 1990's.

The flexibility of being funded by sponsors does provide Sky with the ability to be innovative in its style of presentation and broadcast graphics. This is not exploited sufficiently at the present time.

4.4 Review Conclusion

This short review of weather bulletins of the main televisions channels in the United Kingdom conveys the impression that there is very little difference between the content of presentations. All follow broadly the same broadcast sequence, as follows:



Graphics do tend to vary between the television stations. This variation appears to be mainly in the animation of the graphics and the colours and symbols used to depict the forecast weather; some stations continue to use symbols whilst others have migrated to contour based depiction.

Most stations use presenters as well as graphics, with only Channel 4 choosing to have their news presenter voice-over the weather forecast whilst the graphics sequence is animated.

The SWOT analyses carried out for each station reveal that all have similar properties. The main strengths are in the branding associated with the bulletins, either from presenters or data source. Whilst each of the stations is a threat to each other, due to legitimate competition, other broadcast mediums such as the internet, newspaper and radio present a threat to their forecasts. Of these media the internet probably poses the most substantial threat, as it is accessible by most of the population and one does not have to wait to retrieve a forecast.

Such a brief overview suggests that television stations are very set in their ways regarding weather presentations and may be complacent. The formal structure of the

broadcasts may well be as a the result of audience research, or it could be that the audience has not been consulted and that this is simply what television stations think audiences require in the belief that "other stations do this, so it must be right?".

Perhaps the graphics portray other meanings which are picked up by the audience and so therefore knowing the structure of the forecast assists the audience in remembering what the forecast predicted by requiring less conscious effort and thus allows them to adjust to their lives accordingly.

A more detailed study is required to assess what information the weather graphics actually contain and what information they convey to the viewer. This is to be carried out as a content analysis.

4.5 Content Analysis Introduction

When watching a television weather forecast one can get the impression that forecasts are very similar regardless of the television station one may be watching. The review carried out in section 4.3 appears to concur with this assumption. This assessment may be accurate anecdotally but such a hypothesis needs to be proved scientifically.

Developed during the inter-war period as a method of interpreting written and spoken texts, content analysis was used to measure the accuracy of mass media communication. During World War II it was used by decoders listening to German public radio services in order to detect messages within the broadcasts (Krippendorf 1980). As described by Rose (2005:95) *"Hence its explicit methodology, through which it was claimed, analysis would not be woolly but rigorous, reliable and objective"*.

Krippendorf states that *"Content analysis is a research technique for making replicable and valid inferences from data to their context"*. Rose discusses how content analysis can have some disadvantages when applied to visual images. Using her model (see Chapter 1) she states how the method focuses on the compositionality of the image and the

site of the image itself. By doing this it does not investigate the methods used in production of the image or the audiencing of images.

However, despite the above reservations content analysis is a recognised method of analysing an image by categorising and coding images to achieve a quantitative, objective statement as to what information that image portrays. This content analysis for television weather bulletins breaks down each bulletin into its constituent parts and describes objectively each image.

4.6 Methodology – the Content Analysis Question

It is necessary to have a specific question which one wishes to address in order to aid the categorising and coding of images. Given the hypothesis that television weather bulletins are very similar, the question to be addressed in this content analysis is:

> "How do weather forecast bulletins, broadcast in the United Kingdom differ between the main television stations (BBC, ITV, Channel 4, Sky News), and how do they differ with forecasts televised in Europe and the United States of America?"

Differences between the presentation of weather forecasts could be critical for a station's viewing figures. For commercial television stations the greater the number of viewers watching a particular channel, the higher the advertising revenue that can be attracted by that station. Public service broadcasters also have a duty to maximise audiences in order to prove to government, or those responsible for their funding, that they are producing programmes that viewers want to watch.

By assessing the differences between weather forecasts it may be possible to compare audience statistics and establish which forecasts are most popular, although this is beyond the scope of this paper.

4.6.1 Methodology – Television Broadcasts

A sample of the images used for the study are shown in Figure 4.1 (further images used can be seen in the Appendix). Rose states that *"content analysis must address all the images relevant to the research question"*. This would require the studying of all television weather forecasts but of course it would not be possible to view every weather forecast, broadcast by every television station, every day. Therefore a random weather forecast bulletin was chosen for each television station selected for this study and the viewing made on a single day in October 2006. Background charts broadcast by television weather forecasts do not vary on a day to day basis (apart from the inclusion of severe weather warning statements by some broadcasters) and therefore the random selection of a bulletin would provide similar information regardless of which day was chosen to view a station's forecasts.

It should also be noted that the purpose of this content analysis is not to provide an exhaustive study of television weather forecasts, but to simulate the experience of a viewer who may see several visual weather broadcasts, from different data sources in a single day. Also it was not the aim of this study was to ascertain which graphics viewers preferred but to compare television weather forecasts in the United Kingdom, Europe and the U.S.A from the point of view of a single viewer.

The main television weather broadcasters in the UK were chosen for the content analysis. They are BBC, ITV, Channel 4 and Sky News (BARB 2005). Although regional broadcasters also provide weather forecasts, only those broadcast nationally were selected.

A further content analysis could be undertaken for regional weather broadcasts in the United Kingdom.

When choosing international stations the logistics of acquiring such forecasts were important and so the selection was restricted to those which could be viewed via the internet. Secondly, the author was aware of the need to study weather forecasts in several countries, but again the number of forecasts viewed was restricted by the availability of the broadcasts on the internet.

Figure 4.1 A sample of the images used during the content analysis

Of the United Kingdom broadcasters BBC and Sky News make weather bulletins available to "watch on-demand" via the internet. Both BBC and Sky News weather bulletins were viewed in this way; thus aiding the digital capturing and assessment of the images.

Some international stations also broadcast content via the internet. This method of delivery is still in its infancy and therefore access to the forecasts is somewhat restricted. However, certain stations were available. Those selected for analysis were Meteo.it (Italy, at www.meteo.it), VTM (Netherlands, www.vtm.be), Wetter.tv (Switzerland, http://de.bluewin.ch/news/index.php/wetter/tv/), The Weather Channel (USA,

www.weather.com) and Accuweather.com (USA, www.accuweather.com). Because such broadcasting techniques are relatively new, bulletins broadcast via the internet are restricted to Europe and the USA, although others are expected to be coming on-line soon.

4.6.2 Methodology – Coding of the Images

If the content analysis is to be more scientific than a subjective review of television weather forecasts, it is necessary for the analysis to be replicable.

To this end codes have been clearly defined for the study with questions such as, "Presented or Non-Presented" being constructed in such a way that only a limited number of answers are possible. Ambiguity was avoided where possible, although for some answers there was the risk of a more ambiguous statement. For example "No text, textual information or both". Whilst the ambiguity risk was acknowledged it was felt that it should remain in the content analysis as this related directly to the question posed. Appendix 2 contains a full list of question posed during the coding process.

The coded responses to the selected images were then entered into a spreadsheet. When devising the categories for coding, the question posed in 4.6 was uppermost, with the author wanting to research whether forecasts broadcast in the UK were similar, and when and how they differed; also whether forecasts seen abroad were significantly different from those viewed in the UK, and ultimately to find out if weather forecasts are similar worldwide. If little difference could be found this might indicate that television weather forecasts had achieved a state of perfection or, as the author suspects, that television weather graphics design and sequence ordering are incestuous in that one station follows another because that is the way television weather is "done".

To this end the research aimed to compare forecasts and was careful not to assess forecast accuracy. The first question posed related to whether the forecasts were presented and, if presented, what sex were the presenters? It was then felt important to assess how a

presenter was dressed and whether this style was deemed to be formal or informal and did the presentation style differ accordingly?

Next were questions about the graphical content of the broadcasts. Some broadcasts contain a mixture of textual and graphical imagery, others contain one or the other. Animating symbols were also analysed.

The information contained on the charts was of interest with temperatures, rain, isobars and other elements analysed and coded using a yes/no response. An attempt was also made to categorise additional information displayed by some stations such as the addition of the jet stream, U.V. and air quality data as well as the use of any interpretive weather graphics. The term "interpretive graphics" implies charts with words on that may animate, highlighting areas of important weather and assisting the broadcaster in the telling of the weather story.

This coding system provides the best objective method for analysing the selection of nine weather broadcasts and assessing the similarity of the information contained therein.

4.7 Analysis of Coded Responses

Once the methodology of coding the responses had been established, each of the broadcasts was viewed and coded according to the questions and categories listed in Appendix 2.

Question 1 (Was the forecast presented or non-presented?) revealed that out of the nine bulletins viewed, eight of them were presented, with only Channel 4 using a "voice-over" forecast. The reason for Channel 4 not using a presenter for the forecast is not known, although in the absence of other research it is assumed that this reduces costs.

Question 2 (Is the forecast presented as a geographical representation or non-geographical, or both?) reveals how few television stations vary the geographical

representation of the bulletins. Only the BBC showed broadcast weather forecasts that contained a combination of charts and text.

Of the presented forecasters there was an even mix of male and female presenters. It was notable that the split of male and female presenters was also relatively even across borders, with similar figures for both domestic and international broadcasts. Anecdotal evidence suggests that there has been a significant increase in the number of female presenters over the past few years. For example, until a few years ago all BBC weather presenters were experienced meteorologists, a career dominated by men. This requirement has now been eased, and although BBC presenters undergo a forecaster training course, some may not have spent significant time in an operational forecasting environment as a meteorologist before becoming BBC weather presenters.

Both the dress and style of the presenter (Questions 4 & 5) weighed heavily in favour of a formal presentation. In the UK all bulletins (apart from Channel 4 which has no presenter) were presented in a formal manner with the presenter also being dressed formally. Only Meteo.it of Italy and Accuweather in the U.S.A. opted for an informal presentation style.

Varied responses were revealed in Question 3 (What period does the forecast cover <12hrs, 12-36hrs, 36+?). The forecast period was always greater than 12-hours ahead, perhaps reflecting the needs of viewers and the "tradition" that television forecasts give information further ahead than 12-hours. In four instances the forecasts extended beyond 36-hours, giving the viewer a forecast for the next day or so. It was notable that none of the broadcasts provided forecasts for more than 5-days ahead although this may be as a result of wanting to keep broadcast time to a minimum.

Of the data contained within the bulletins (Question 7) four stations displayed no textual information (note that this related to textual information shown throughout the bulletin or together with symbols not to textual information shown as a headline at the

beginning or end of the bulletin). These included the BBC and Sky. ITV and Channel 4 both included brief textual summaries during their forecasts, displayed besides the symbol charts, although it is worth noting that the BBC do show a text summary during broadcasts on terrestrial television.

The only station to use purely textual information and no temperatures was The Weather Channel in the USA. Both BluWin and AccuWeather included a combination of both techniques in their bulletins. This suggests that stations are using variations on a theme when displaying information, generally using symbols, occasionally enhanced by the use of text.

BBC and VTM used a combination of contours and symbols to illustrate their weather forecasts (Question 8), although both stations heavily favoured the use of contours, with symbols used sparingly. Sky used only contours, whilst Channel 4 and ITV used only symbols. Note that this category excludes isobars.

This is a significant change from a few years ago when only symbols were used in the weather broadcasts. The change is possibly due to the technological advances in computer graphics now making it possible to easily display temperature or other contoured data.

Overall the use of symbols featured in 5 broadcasts, contours in 3 and only Accuweather used art (in the form of animating graphics) as the main method of communicating the forecast. Out of the 8 stations 5 of them used animating symbols (Question 11) or contours, and these included all of the stations broadcasting in the U.K. The Weather Channel, BlueWin and Accuweather used non-animating symbols or non-animating contours.

An innovation recently introduced by the BBC is that of a "tour". This involves an imaginary camera taking a "tour" around the country and showing a zoomed in view of the weather in various regions. This technique has been used by GMTV (ITV's breakfast

television programme) although this broadcast does not form part of this analysis. VTM and Accuweather used a similar technique. As for the aspect of the map only the BBC used a "tilted" projection with all other stations opting for a "flat" view (Question 9).

With stations using visualisation techniques such as animating contours, moving maps and "tours", it was surprising that only VTM showed webcam images in their broadcasts (Question 12). Webcams are useful to viewers in providing a snap-shot of conditions over an area of interest. They can also portray current conditions more concisely than a presenter. Copyright problems could be a reason for television stations not showing such images, but agreements could be sought in order to create a group of cameras whose owners grant permission to use images on-air.

Each broadcast was then viewed with respect to the type of information contained within the forecast and the information contained therein (Question 13). Only two of the stations (The Weather Channel and Accuweather) did not show cloud and rainfall, whilst all the other television stations depicted cloud and rainfall in some way. Most chose to show rainfall as animating droplets. Cloud tended to be shown as a grey area. The BBC showed rainfall as blue "puddles", depicting accumulated rainfall, whilst rain fell from the cloud above. Sky depicted the rainfall by overlaying it onto an area of cloud below.

Temperatures were shown by seven of the stations. These were very similar, being shown in boxes with figures written within the boxes. Meteo.it and The Weather Channel did not show temperature information at all, with information on temperatures conveyed by the presenter.

Only two stations depicted isobars - including the centres of high and low pressure and fronts - these being VTM and Accuweather. The remaining seven stations did not predict pressure or frontal systems in any way. The lack of pressure and frontal information during television weather bulletins in the UK has raised a number of complaints. Until the introduction of new BBC television graphics in 2005, frontal charts were shown almost

daily. Since then, the use of these has declined. Whether this is preferred by viewers is subject to further research and the results are shown in Chapters 4 and 5.

Five stations showed satellite pictures, whilst only two of them depicted radar information, these being Sky and Accuweather. Whilst satellite and radar pictures do appear to be easier to interpret than frontal charts, this has also not been assessed by undertaking research with viewers.

Interestingly none of the stations broadcast additional information such as air quality, ultraviolet forecasts or comfort indices. It could be argued that this information is some of the most relevant to viewers and should be routinely included in broadcasts.

It is worth noting that the only station to broadcast interpretive information graphics (described in the content analysis as "storytelling") was Accuweather. This method involves highlighting areas of weather on map, sometimes labelling them with text and then animating these over a map.

An additional question to the content analysis was the length of broadcasts. These ranged from 1 minute to over 5 minutes.

4.8 Content Analysis Conclusion

From this limited content analysis, one can produce a "standard" TV Weather Forecast Template, containing the most popular format for a television weather forecast as shown in Table 4.1.

This template is produced by looking at factors most common to each of the category questions shown in Appendix 2. By creating such a template one can see how television weather forecasts are produced along very similar lines.

In order to facilitate this template, forecasts were divided into categories; forecast style, period of the forecast, graphical representation, information conveyed, length of the forecast.

1. Forecast Style
A male or female presenter, dressed in formal clothes and presenting the forecast in a formal style.

2. Period of the Forecast
The forecast covers a period greater than 12-hours and less than 5-days

3. Graphical Representation
The forecast presented on non-tilted, non-animating (i.e. static) maps.
A combination of maps and text is used.

4. Information Conveyed
Satellite pictures are shown.
Using animating symbols or contours the forecast conveys information about cloud, rainfall and temperature.
Textual information is not included.

5. Length of Forecast
Forecast is between 1 minute and 1.5 minutes in length.

Table 4.1 TV Weather Forecast Template using content analysis results

By interpreting each of these categories one can produce the TV Weather Forecast Template.

The TV Weather Forecast Template shows the limited design of current television weather forecasts. Almost any television station's weather content would fit into the Template, revealing how similar the data conveyed is, both spatially and temporally. Most forecasts show a satellite picture followed by a series of maps conveying information such as rainfall and temperature.

Perhaps television stations should actively try not to conform to the Template in order to offer viewers a more varied watching experience. This may appeal to potential sponsors, offering commercial stations enhanced revenues as viewers may be more inclined to watch if the information broadcast is more relevant to their needs.

Very few of the forecasts contain additional information such as pressure and frontal details, radar, sea surface temperature details and jet stream forecasts. These details may aid the viewer in understanding the forecast and could also help in assessing the accuracy of the forecasts in terms of confidence levels and underlying uncertainties.

Of greatest surprise is the lack of the use of health and "feels like" information, or to use a more generic phrase, "lifestyle forecasts". If television forecasts are produced for general public consumption, then these are details of direct relevance to the audience. It is harder to interpret a temperature of 30°C and a humidity of 60% as feeling uncomfortable and having a possible health implication, than to describe the situation as "uncomfortable". An alternative may be to use an indexing system for such lifestyle forecasts. For example, use a scale of 1 (comfortable) to 10 (uncomfortable) and provide a forecast for each major city. The viewer can then immediately interpret the forecast for tomorrow as being "uncomfortable".

Probability forecasts are also not used. These are useful when conveying forecast uncertainty, although it would be necessary to explain to viewers how to properly interpret probability forecasts, i.e. that "a 70% probability of rain" indicates that on 7 out of 10 occasions, given a similar synoptic situation, rain could be expected to occur, although one of the problems with issuing probabilistic forecasts is ensuring that human forecasters also interpret the forecast data correctly and issue forecasts accordingly (Doswell 2004). By using weather presenters to educate the viewer into the use of probability forecasts, the presenters role as a 'science communicator' (Wilson 2008) could be advanced, broadening the broadcasting reach of the presenter while at the same time enhancing their credibility.

The use of maps in forecasts makes an assumption that viewers can correctly identify their town on a map. Chapter 5 details a limited survey to assess location accuracy by asking respondents to place their current position on a map.

Results have suggested that the number who can identify their location correctly is relatively few, with only 70% of a small sample size able to locate their present location to within 40km (Keeling 2008). If this is a prevailing result then the use of maps in weather forecasts without town names must be questionable. Alternatively it may be that schools, colleges and universities should be strongly encouraged to ensure that students are sufficiently educated to be able to identify key towns, cities and their own location on a map.

This study shows that the majority of television weather forecasts are very similar. Is this because of apathy, a belief that the televisions stations have "got it right", or a lack of knowledge of what viewers want from televisions weather forecasts?

I believe that it is a combination of all three questions. Television stations believe that they know what their viewers want and undertake regular audience research. However viewers may not know of other weather forecasting styles simply because these stations have not been offered to them.

In my experience television stations do take an apathetic approach to weather forecasts; they understand that viewers want a forecast, but don't quite understand why it needs to be part of the programming; for example, if it has to be included in a news programme, it should be as short and concise as possible or should be made lighter to include details of local fetes or short films/news items about school projects. This detracts from the importance of the forecast, which for many people is of great interest.

By watching what other stations do the "if it ain't broke, don't fix it" attitude does seem to pervade. Television stations seem happy to provide the same weather forecast format as rival channels; and appear not to realise that by providing a more comprehensive forecast, increased sponsorship revenues could be generated.

4.9 Suggestions for Future Research

The number of stations included in the content analysis could be extended to cover the many hundreds of weather forecasts broadcast across the world. Such a study would only be restricted by accessibility to the forecasts, many of which are not broadcast via the internet or satellite and so are hard to identify, record and view. One could also study regional forecasts within the United Kingdom.

It would also be of interest to interview those responsible for the design and production of weather forecasts within the televisions stations. This should reveal the design and planning implemented during the creation of a new television weather forecast or a graphical redesign.

Questions that are raised by this research, include:

1. Why use presenters? What research has been carried out into the effectiveness of forecasts which provide a voice-over only?
2. Why should presenters wear formal clothes and presentations made in a formal style? Do viewers prefer this?
3. Why do forecasts extend between 12-hours and less than 5-days ahead? Is there a desire for very short period "grab-and-go" forecasts covering less than 12-hours and outlook extending beyond 5-days?
4. What do viewers understand by the use of fronts, satellite and radar charts?
5. Would the inclusion of lifestyle information make the forecast more appealing? If so, what information should be included?
6. The length of each broadcast appears to have settled around 1 minute to 1.5 minutes. Has this length been achieved through viewer research and is this what viewers prefer, or is it because television stations are reluctant to devote more than this amount of time to a weather forecast in the belief that viewers will not watch?

Content analysis is only one part of analysing weather forecast bulletins and much more work needs to be undertaken in order to produce the optimum weather framework around which broadcasters can build their weather output.

CHAPTER 5:

A SURVEY OF TELEVISION WEATHER FORECAST USERS

5.1 Introduction

Having completed a content analysis and found that weather forecasts are similar throughout the UK, Europe and USA, it is important to establish why this should be. Is it because forecasts have evolved and now offer exactly what a viewer requires, or perhaps it could be that viewers can only absorb a limited amount of information before becoming 'overloaded' and therefore bulletins must follow set timelines and sequences?

It is important to establish what information a viewer can remember when watching a television bulletin. Studies have been carried out, such as that by Lowe (1999 & 2003) to establish the recall of certain charts by meteorology undergraduates but no research can be located regarding the recall pattern of television weather forecasts amongst non-meteorologist viewers.

Viewers understanding of the information they are being shown is also fundamental to the understanding of a weather forecast. If a viewer is watching a forecast and is not able to interpret the information they are shown, they will not be able to make an effective assessment as to what information the weather forecast was attempting to convey. Chapter 6 contains a survey which attempts to assess how much of the forecast a viewer understands and can recall.

5.2 Survey Grouping

This chapter contains a survey conducted in order to establish how much information a viewer can accurately recall about a standard television weather forecast broadcast in the United Kingdom.

Motivation for watching a television weather forecast is acknowledged as of primary importance, using the hypothesis that one is more likely to recall information broadcast during a television weather forecast if one has made a specific effort to watch the bulletin, instead of the forecast just happening to be on the television at the time one is viewing.

It was therefore decided that two groupings of viewers would be necessary to complete the surveys, thereby reflecting the varied reasons viewers watched the weather forecast.

5.2.1 Weather Passive Definition

For some viewers a television weather forecast may be something that they watch as part of other programmes. They may be watching in order to watch a specific programme, the weather forecast being an incidental part of this viewing, or that the weather forecast is on before or after a programme they have made a special effort to watch. It may be that the television may be on as background-noise and superfluous to another activity. This group have been titled 'Weather Passive'.

For this survey it was felt important that the Weather Passive Group and Weather Aware groupings should all be watching the forecasts in a similar way. It was therefore decided that the Weather Passives would watch the forecast in the same lecture theatre, this ensuring that no extraneous factors were present when viewing the forecast. Such control could not have been exercised if the survey had been carried out 'cold' on members of the public, for example in a high street when distractions such as traffic noise may have made concentration difficult.

This is an accepted technique when undertaking focus group research for television. The BBC Editorial Guidelines (BBC 2008) state,

> *"Focus groups do not necessarily need to be "balanced", even if the research is about politics or public policy. It may be legitimate to conduct*

such research into particular groups, such as "Labour voters" or "working women""

While this does limit the interpretation of the research in terms of not providing a true 'random' sample, it does enable the survey results to be devoid of sampling anomalies due to social and dynamical settings.

5.2.2 Weather Aware Definition

A second group of individuals have been identified for whom the weather forecast may be integral to their well-being or lifestyle. This group are likely to make a special effort to watch a particular forecast. For example, a farmer may want to know at what time rain is to arrive, the holiday maker may want to discover the best day to head for the beach or the sailors may need to know whether winds will reach gale force. This group are entitled the 'Weather Aware'.

Once again the group were invited to take part in the survey in similar social and dynamical settings. The forecast was viewed via the respondent's computer and therefore one can be satisfied that in order to watch the forecast a certain amount of concentration would be needed. Due to the nature of watching video via computer one can be certain that a computer terminal would be necessary to view the video, together with speakers or headphones in order to listen to the audio of the forecast (the video was not available to view via mobile telephones).

5.3 Methodology

The primary reason for undertaking this survey was to establish what the 'general' television weather viewer could recall about a weather forecast having watched a standard British weather bulletin. Respondents were separated into Weather Passive and Weather

Aware and then asked to answer a series of questions relating to the forecast immediately after watching the bulletin. Note that the Weather Passive group were also asked to identify their current location on a blank map of the British Isles and Ireland. Responses were collected and analysed and the results are presented below.

5.4 The Forecast Bulletin and Methodology

Access was granted by the BBC to archive weather broadcasts made on the regional television news programme for the western Midlands, called Midlands Today. The programme is broadcast three-times per day at 1330-1340, 1830-1855 and 2230-2235, with weather bulletins broadcast at the end of the 1330 (lunch) and 1830 (teatime) programmes.

The amount of time allocated to the weather forecast on Midlands Today can vary on a daily basis with the teatime programme more likely to see forecast lengths between 1minute and 2 minutes 30 seconds. Lunchtime programmes tend to remain at around 1 minute to 1 minute 30 seconds with limited day to day variations. Therefore it was decided that a lunchtime bulletin should be chosen for this survey as this represented the most consistent presentation in terms of length and images shown.

Figure 5.1 Kay Alexander introduces the forecast

A randomly selected broadcast was chosen. Beginning with an introduction (Figure 5.1) by the main news presenter (Kay Alexander), the forecast is then presented by the author and lasts approximately 1m 30s. The forecast presentation begins with a UK pressure and frontal forecast animating sequence extending from Thursday to Sunday. Moving rather quickly, the sequence

Figure 5.2 Low pressure west of Ireland by the weekend

shows fronts moving through the British Isles and the weather dominated by low pressure. The presenter makes special reference to the low pressure being centred west of Ireland (Figure 5.2) through the weekend; stressing how low pressure is in control of the weather.

Figure 5.3 Town & city league table forecast for the weekend.

Next is a town forecast league table for the weekend (Figure 5.3), and again the presenter stresses that this forecast is for the weekend *not* the following day. Rain is mentioned for most of the Midlands towns and cities through the course of the weekend and temperatures are described as "not bad".

Figure 5.4 This afternoon – cloudy and very warm

A forecast is then made for the following two days, with this afternoon being mainly cloudy, although with a few brighter spells. Mention is made of this afternoon feeling very warm with a maximum temperature of 19°C (Figure 5.4).

Overnight the weather is forecast to be rather cloudy and misty with "bits and pieces of drizzle rather than anything persistent" and is also forecast to be mild.

Figure 5.5 Tomorrow's weather – wet!

The presenter then briefly introduces tomorrow's weather. The chart is shown to be a mass of blue with animating droplets indicating widespread, heavy periods of rain. Concluding the bulletin the presenter says, "and a quick look ahead at tomorrow... you just really don't want to see that". He then 'throws-back' to the news presenter. The forecast was recorded on DVD for playing to survey respondents.

A full transcript of the weather bulletin is provided in Appendix 3.

5.4.1 Methodology – Weather Passive

A group of people were required to watch the forecast bulletin and then answer questions about it. However, it was necessary to recreate the conditions under which a Weather Passive viewer may see and hear the television weather forecast.

Therefore a group of 153 first year undergraduate geography students were selected as the Weather Passive respondents. At the time of the survey (early 2006) the geography students were a few weeks into their course and it was felt that this grouping of similarly educated, similarly aged respondents in a known social setting would provide the most representative responses to the questions subsequently asked.

At the end of a regular, weekly lecture at the University of Birmingham the group were requested to take part in a PhD survey. It was explained to them that research was being carried out into how people watch news and weather forecasts and that their participation was voluntary. Note that questionnaires were not given out at this stage and so the 'viewers' were unaware of the questions which would be asked.

Using a large projection screen and high quality audio-visual equipment, the bulletin was shown to the students. Note that not only was the weather forecast bulletin shown, but also two minutes of the programme preceding the forecast, and the closing titles of the programme, thus ensuring that the viewers were unaware of the questions they would be asked.

At the end of the presentation a survey sheet was distributed (Appendix 5). Students were asked to wait until everyone had received a copy before completing the survey, and not to compare answers. As well as completing answers relating directly to the broadcast, the Weather Passive group were also asked to mark on a blank map of the British Isles and Ireland where they were currently located (i.e. Birmingham).

Survey sheets were then collected and the students left the lecture theatre, the whole survey process taking approximately 15 minutes to complete.

5.4.2 Methodology – Weather Aware

There are times when viewers watch the television weather forecast with a specific purpose in mind. It could be that they are interested in the weather for the coming weekend, or perhaps that there is a specific event they are attending which is dependent upon the weather. Farmers, sailors, aviators and others also watch the weather forecast with increased interest as to them the weather is critical for the operation of a successful business, or make the pursuit of their hobby more enjoyable.

It was therefore necessary to compile a group for whom the weather forecast is important. This group is known as "Weather Aware". Every Thursday the author sends a weather forecast for the coming weekend by email to over 1400 sailors, pilots, farmers and others who have more than a passing interest in the weather.

A video of the same weather forecast was uploaded to the YouTube website for online viewing by those who wished to take part. The news items before and after the bulletin were not included (as they were in the Weather Passive group). This was because the research required the recreation of the conditions of watching a weather forecast which one had made a special effort to see and had more than a passing interest in. The group also knew that questions were to be asked about the weather forecast they were about to see.

An invitation to take part in the survey and research was then sent to the sailors, pilots and others mentioned above. Those who responded were asked to visit an online survey (operated through the website SurveyMonkey.com) which was used to collect responses. The respondents were requested to watch the video first and then immediately complete the questionnaire in full. It was stressed that the respondent should only watch the forecast once.

As such the survey was fully completed online and the results were available immediately for analysis. The survey was available for completion for two days after the initial invitation to take part was sent to the group.

5.5 Weather Passive – Results

A total of 153 survey responses were collected and these were then collated manually, a summary of the responses can be found in Appendix 5.

Of the respondents most correctly identified that the weather presenter was male, although a small percentage did list the presenter as 'female'. This may have been due to a female news presenter introducing the weather presenter and so may reflect some ambiguity in the question posed, 'was the presenter male or female?'.

When estimating how long they thought the bulletin was, a wide spread of results were shown. Most estimates (36.6%) correctly estimated the bulletin at between 1 and 1.5 minutes. However, a significant proportion of the audience also answered 30 to 60 seconds, and 1.5 to 2 minutes (31.4% and 27.5%) respectively. Perhaps this shows that audiences are unable to estimate the amount of time spent on a forecast and therefore, a forecast could be longer than the traditional 1.5 to 2 minutes without the audience forgetting what has been said or the information they were looking at?

When asked what information was contained on the maps, it should be remembered that the audience were only shown the new BBC "graphical" maps. These do not contain symbols but portray rain and cloud as a series of filled-in contours.

The first item to note is that less than half of those watching (43.1%) realised that cloud information was being portrayed and even fewer (24.8%) recognised that where the cloud broke the sun would be shining. These may be considered subtle graphics by comparison to temperature information which is clearly shown on the maps, and animates as the presenter states the temperature of the day; only 64.1% said that temperature

information was shown, with just 30.1% saying that wind information was displayed (shown together with temperature figures).

The highest response was reserved for rainfall depiction (73.2%). One would have expected that with the final graphic depicting lots of rain, and the presenter highlighting that tomorrow would not be a pleasant day, this response would have been higher.

A surprising result was that 59.5% recognised that frontal maps had been shown. These were broadcast at the beginning of the forecast and so may have been well retained by the audience. Also, the audience were geography students and so would probably have had a high recognition of synoptic charts.

When asked how the weather was going to "feel", 52.9% correctly responded "warm". However, once again this number is relatively low given that the presenter stressed the warmth of the weather. In fact, 35.9% said that the weather would feel "cool"; even more surprising given that the word "cool" was not used at all in the broadcast.

Responses were more positive when asked how far ahead the weather forecast extended; 49.7% said "the weekend" while 30.7% said "Sunday". Both responses were correct, with a total response of 80.4%.

A question that was not well answered was "Where was low pressure situated by the weekend?". This is to be expected as the information was only briefly on screen and mentioned by the presenter as being, "...to the west of Ireland". 38.6% stated that they did not know where low pressure would be, with only 12.4% responding correctly.

When asked about maximum and minimum temperature forecasts, daytime temperatures were more accurately recalled. 40.5% correctly answered that temperatures would reach 19°C (a figure on the map and stated by the presenter), a further 32% responded with 18°C (only shown on the map). Minimum temperatures were not accurately recalled, despite being shown on the maps and mentioned by the presenter. Only 3.3% answered correctly (15°C). Of the 'don't knows', 12.4% acknowledged that they could not

recall the maximum temperature, while a much larger 41.2% stated they could not recall the minimum temperature.

The response to the question about tomorrow's weather was expected to be positive, and this was the case. Having been stressed both by the presenter and the graphics, 89.5% correctly stated that the weather would be "wet".

Despite not being able to recall accurately the length of the bulletin, 83% said they thought its length "about right". This is potentially good news for broadcasters as the audience were clearly satisfied with the broadcast.

The Weather Passive audience thought that the combination of maps and presenter were most useful, (51.6%). Those who thought that the presented maps were most useful were fairly evenly split (27.5% and 20.9% respectively).

The questionnaire then asked about the viewing habits of the group. When asked how many television weather forecasts they saw each week, 51% said that they watched between one and three bulletins in a week. Over a quarter (26.1%) watched less than one bulletin per week with 15% watching between one and four bulletins.

It was then necessary to find out why the respondents would watch a television weather forecast (more than one option could be selected). Over half of them (55.6%) stated that they watched the forecast for something specific. 43.1% said they watched because they were interested, 17.6% watched at the weekend, while 18.3% watched the forecast because there was nothing else on.

It is important to establish the methods that are currently being used to view weather forecasts. More than one option was able to be selected. The most likely method of weather forecast retrieval is terrestrial television (BBC, ITV, Channel 4 or Channel 5) with a response rate of 75.2%. The second most likely source was the internet with 56.9% and thirdly radio with 30.1%. New media techniques such as podcasts (0%) and TV on Mobile (2.6%) were very unlikely to be used, although 9.2% viewed via a website.

But how would the group most likely get weather forecast in the future? Terrestrial television is still marginally the most likely at 56.9%. Websites were second at 51.6% and third was radio at 22.9%. The response to new media use in future had improved slightly, although had remained low with 3.9% using podcasts and 11.1% watching TV on Mobile, however only 5.2% saw themselves viewing via a website in future.

As an extra question, the Weather Passive group were asked to mark their present location on a map of the British Isles. Of the 152 who responded 23.7% places their location to within 20km of the University of Birmingham (Edgbaston) campus. 47.4% marked to within 20 and 40km.. 18.4% could get to within 40 to 60km, whilst 6.6% could only get to between 60 and 80km. Although only representing 3.9%, 6 of the respondents marked their location beyond 80km from Edgbaston.

5.6 Weather Aware – Results

A total of 237 responses were received and collated automatically online. A summary of these results can be found in Appendix 6.

Most of the respondents correctly identified that the weather presenter was male, with only one response as female.

This group were better at estimating the length of the broadcast, with 47.7% selecting 1 to 1.5 minutes. 20.3% gave 30 to 60 seconds and 25.7% gave 1.5 to 2 minutes. The results for either side of these figures were very low.

Asked about the information displayed on the maps (Question 3) the responses were very good. Interestingly temperature and fronts were the most correctly identified with 75.9% and 75.5% respectively. Most of the other elements displayed were also listed although 5 (2.1%) did say that radar images had been shown too. 11 responders (4.6%) also said that a satellite picture had been shown; both of these were incorrect.

70% (166) responded that the weather was going to be feeling warm, with 17.3% (41) thinking that it would be chilly. This is considered to be low for the Weather Aware group, given the emphasis that was placed on the warmth during the forecast. However, when asked how far ahead the forecast went, 81.1% (197) currently answered Sunday or the Weekend.

The question about the positioning of the low pressure system saw 28.7% (68) responding correctly that the low pressure would be west of Ireland. The other locations were reasonably well spread, with 20.3% (48) responding that they did not know where the low would be.

The day's maximum temperature of 19C was correctly recalled by 53.4% (126), although a further 21.6% (51) recalled 18C, perhaps because this figure was also shown on the graphic. Overnight minimum temperatures of 13C were selected by 22.9% (54). Possibly showing the importance placed on daytime temperatures by viewers.

When asked what tomorrow's weather would be like, 89% (211) stated that it would be wet, as emphasised during the forecast bulletin.

As for the length of the forecast, over half (51.7%, 122 respondents) felt that it was about right. Interestingly a further 42.8% (101) thought that the bulletin length was too short. These two choices elicited 94.5% of the responses to this question.

Question 11 asked whether the presenter, maps or a combination of both were most useful in conveying the forecast information. Only 4.2% (10) responded that the presenter was most useful. 42.2% (100) thought that the information on the maps was of most use, whilst the majority (53.6%, 127 respondents) stated that a combination of both maps and presenter was most useful.

The question about how many TV weather bulletins were watched each week revealed interesting responses. 40.9% (97) said that they watched more than 7 TV weather

forecasts each week, with a further 34.6% (82) watching between 4 and 6 bulletins. Several though (24%, 57 respondents), watched less than three bulletins each week.

The Weather Aware group were then asked why they watched a TV weather forecast. 51.7% (122) said it was because they were interested in weather, with 39% (92) saying that they were watching for something specific (this is not a surprise as the group was made up mostly of aviators, sailors and farmers).

Where a member of the Weather Aware group gets their weather information from is of critical commercial importance. 95.8% (227) used web sites as a source of weather information. 76.8% (182) used terrestrial television, compared with only 13.1% (31) using satellite television. 49.4% (117) said that they listened to the radio for forecasts.

As for the future, 97.5% (230) said that they would like to get weather information from web sites. 77.5% (183) thought that terrestrial television would still play a major part with satellite television seeing a slight increase at 14.8% (35). Interestingly, television viewed via a web site saw an increase to 14.8% (35) with only 6.8% (1) viewing by mobile telephone.

5.7 Discussion of the Results

By comparing the results from the Weather Passive and Weather Aware groups, one is able to ascertain how the different groups 'watch' weather forecasts. It must be remembered that the Weather Passive group did not know that they would be questioned about the forecast, whereas the Weather Aware group did know that they would be asked questions about the forecast, and this is likely to have an influence on the results.

Viewers are not good at estimating how long the forecast presentation is. The Weather Passive group were better at this, but over half still under or over estimated. Weather forecasters want to maintain the viewer's interest in the forecast and the majority of respondents thought that the bulletin length was about right. Several of the Weather

Aware group felt that the bulletin was too short, whilst very few of the Weather Passive group thought this. This may indicate that although forecasts are long enough for the general public, they are too short for those with a more specific interest in the forecast, either in a commercial context or in the pursuit of a hobby.

But what of the method by which the weather information is conveyed? The research suggests that viewers are happy with the combination of presenter and maps, with the presenter usually reinforcing the information conveyed on the maps. This result was unsurprising as this is how most weather forecasts are presented. It was the second most popular answers that provided the real insight into the different groups. The Weather Aware group thought that a presenter was more important than the maps, whereas for the Weather Passive group this position was reversed. Different groups have different requirements and television weather forecasts currently do not provide for these various groups. However, as television forecasts are public it could be argued that with over 50% of the Weather Passive group stating that the bulletin was about right, and assuming most viewers are 'weather passive', television stations are satisfying the majority of the audiences' needs.

There was a significant difference between the number of forecasts watched each week by each group and their reasons for watching. The Weather Aware group mainly watched between 1 and 3 forecasts, with a significant minority watching less than one bulletin in a week. They tended to watch the forecast for something specific or because they were interested. Compare this with the Weather Passive group who watched more than 7 forecasts each week, although again they watched because they were interested or for something specific. Whilst most people watch forecasts for the same reasons, those for whom weather is part of life, rather than an addition to it, watched more forecasts. Does this again show that although most viewers only watch weather as a passing interest and may watch a small number of times each week, those who watch more regularly may be in the minority but given the number of bulletins they watch could actually be in the majority?

The methods used for viewing forecasts provided interesting results. For a comparison of Weather Aware and Weather Passive viewing preferences, see Table 5.1 Virtually all of the Weather Passive group viewed forecasts via a web site, showing how important this technology has become. Less of the Weather Aware group viewed weather web sites, with most using terrestrial television to access forecast information. Interestingly, new technology such as television on mobile telephones, or podcasts showed low scores for both groups. This must be of concern to broadcasters as it shows that users are either not aware of or not willing to use such technology, or it may be that the required content is not yet available via these sources.

From what source(s) are you most likely to get a weather forecast ? ***(multiple responses allowed)***		
	Weather Passive	**Weather Aware**
Web site	57%	96%
View via web site	9%	5%
Text message	1%	5%
BBC, ITV, Ch4, Ch5	75%	77%
Radio	30%	49%
Listen on telephone	1%	4%
Podcast	4%	0%
Listen via web site	3%	1%
TV on mobile	2%	0.4%
Sky/Satellite TV	12%	13%
Newspaper	23%	18%
Fax	0%	1%

Table 5.1 A comparison of Weather Aware and Weather Passive responses when asked which methods they currently use to retrieve weather forecasts.

So how do viewers expect to watch in the future? (see Table 5.2, note that no definition of 'the future' was given). The groups retained web sites, terrestrial television and radio as the most likely methods for retrieving weather forecasts in the future. There was a significant rise in those who saw text messaging as a method of forecast delivery; this was true for both groups. Television via a web site saw a rise amongst the Weather Passives but a fall amongst the Weather Aware, although the Weather Aware group showed more of a rise in those viewing via a mobile telephone. Again, these findings must concern forecast broadcasters as it shows that there is a need to promote new technological advances and get potential customers using such methods. It is possible that the appropriate content is not yet available. One should also ask the question why new technology (such as mobile telephones) is not being used more? A major advantage of watching via a website is that the viewer can watch the forecast repeatedly should a part of the forecast not be clear.

If the viewer watches a forecast on television, how much of the bulletin can they remember? The bulletin first showed a frontal chart and over half of both groups stated that this had been shown. This is certainly a good recognition figure, although remember that the 'Weather Passives' were geography students and so their recognition of the chart is likely to be higher than the general public. When asked where low pressure would be situated over the weekend few answered correctly, although the figures for the Weather Aware group were satisfactory. However, frontal charts have been withdrawn from many bulletins recently due to the belief that viewers cannot understand them. This research contradicts this, and at times frontal charts can be very useful, complementing the presenter's explanation of the weather situation.

How would you like to get weather forecast in the future ? *(multiple responses allowed)*		
	Weather Passive	**Weather Aware**
Web site	52%	97%
View via web site	5%	15%
Text message	14%	17%
BBC, ITV, Ch4, Ch5	57%	77%
Radio	23%	50%
Listen on telephone	3%	6%
Podcast	4%	6%
Listen via web site	5%	10%
TV on mobile	11%	7%
Sky/Satellite TV	10%	15%
Newspaper	14%	14%
Fax	0%	2%

Table 5.2 A comparison of Weather Aware and Weather Passive responses when asked about where they will source weather forecasts in the future.

Both groups responded that rainfall and temperature data were shown on the maps. There was good recall about what the presenter said regarding temperatures with both groups acknowledging that the weather would feel warm and correctly remembering what the maximum temperature would be. Here the words of the presenter reinforced the information conveyed on the maps.

What was not so well recognised by both groups was that the maps were also depicting areas of cloud and sunshine. If viewers do not recognise that the maps were trying to show this information, their understanding of the forecast could not be complete. This is

especially concerning when considering the Weather Passives group, of whom only 62% acknowledged that cloud information was shown on the maps, and only 35.9% responded that sunshine was shown. Of concern is that if those for whom the weather is important, perhaps for financial reasons or even personal safety, cannot recognise what the maps are showing, then those who are not weather aware would be even less capable of recognising the information which is attempted to be conveyed.

5.8 Conclusion

The survey carried out above was completed using the BBC weather graphics system which now uses shaded contours as it's main graphical display method. These are called into question by the very low recall rates amongst viewers with regard to the information attempting to be conveyed on the maps and perhaps need to be reviewed and made clearer. Further investigation into viewers preferences for symbols of contours have been carried out (see Chapter 6).

The characteristics of weather depiction on the maps could also be improved. An example of this is sunshine which is currently shown by 'lightening' the map from a dark yellow to brighter yellow. The reintroduction of a sunshine symbol may help viewers understand what the weather is forecast to be in such a situation and avoid any confusion as to what the weather is likely to do. Predictions of rainfall can also sometimes be confusing with the distinction between showery and frontal precipitation not made particularly well. It may also be possible to provide a graphical distinction between showery precipitation (convective) and that produced by fronts (dynamic) making it easer for the viewer to understand the weather story.

The length of bulletins does appear satisfactory to most viewers, although it may be that individual groups of users would require a longer bulletin in order to satisfy their specific needs.

Presenters do contribute to the value of the forecast by reinforcing the information contained on the maps, and despite the contrary happening in practice, viewers do wish to see frontal charts displayed.

Further research is now required into the method of graphics displayed, to investigate whether symbolic charts or contour charts are preferred by viewers, and which charts most usefully convey the weather story.

The Weather Aware and Weather Passive groupings could also be defined more rigorously. One interesting area would be to expand the Weather Passives to include a broader sample of the population, removing the educational and social similarity implied by the Weather Passives used in this study (1st year undergraduate students). It would also be useful to split the Weather Aware into those for whom weather is more than a passing interest (i.e. anglers and farmers) and those for whom weather is a matter of life or death (sailors, pilots). This may reveal any changes across demographics and education within these groups.

CHAPTER 6:

A SURVEY TO EXAMINE VIEWER INTERPERATATION OF TELEVISION WEATHER GRAPHICS

6.1 Introduction

As discussed above it is necessary to examine how well viewers interpret weather forecasts that are presented using contours, as per the new BBC weather graphics system, or whether viewers prefer to view symbols, much used on websites.

Such a survey has not previously been conducted. How a forecast is interpreted is important for television stations as it may aid the design of weather graphics and enable such displays to be of most use to viewers. This could therefore increase the usefulness of the forecast, the number of people watching and hence the value potential sponsors would place on the weather bulletin of a particular television station, or the extent to which a public broadcaster fulfils its public service remit.

6.2 Methodology

A ready means of displaying and assessing information was necessary to complete this survey and by completing the survey online respondents could give an immediate response to visual displays.

The existing Weather Aware group and a randomly selected group of Weather Passives completed the survey. The Weather Aware group were emailed and invited to take part in the survey. It should be noted that for this survey there was not a requirement for a similar social setting when viewing the graphical data and so some Weather Passives were approached 'cold' during outdoor interviews in the Bull Ring Shopping Centre, Birmingham and also through email invitations. These were achieved by emailing known

personnel in companies, and asking them to forward the email to colleagues inviting them to also take part.

Several questions were posed, all providing multiple choice responses. This restricted the number of responses that could be given and eased data collation. The survey has been designed to illicit a wide range of responses, from a large group of people.

The online survey was created using SurveyMonkey.com. This survey comprised a series of 23 questions for both groups, although a further ten supplementary questions were asked of the Weather Passive group to ascertain their weather forecast viewing habits. Most of these questions had already been asked of the Weather Aware group and it was felt unfair to ask them to respond to the same questions again.

The questions were designed to ascertain what information the viewer could glean from various weather graphics.

Graphics shown were those used by the BBC; a combination of contours shown on map, and new icons for outlooks. Symbolic graphics were shown from Weatheronline as these most accurately mirrored the regions used by the BBC forecasts and use familiar symbols.

Two further questions invited responders to enter their comments about television weather forecasts, and also to leave their contact details so that they may be questioned further at a future date if necessary.

During the survey, 282 Weather Aware individuals responded, while 141 Weather Passive volunteers took part resulting in a total sample size of 423.

6.3 Weather Aware - Results

(Responses to these questions are shown in Appendix 7). The first three questions of the survey were designed to establish the level of understanding of basic weather symbols amongst the respondents. A front was described, as depicted on a weather chart and the

respondent was given a choice of responses; warm front, cold front, occluded front or trough.

Responses to the four questions were very positive with more than 95% correctly identifying fronts and almost 92% being able to identify a trough. These results show that the group is indeed 'Weather Aware', although a comparison with the same questions asked of the general public would be interesting.

Figure 6.1 BBC contour chart (left) and Weatheronline symbol chart (right) as described in questions 5 & 6 of survey

Questions 5 to 12 showed static, graphical representations of weather forecasts with responders asked to select the statement which they felt most accurately represented the weather forecast.

Question 5 (see Figure 6.1) showed a contour chart of the southwest of England region covered in cloud and rainfall, with the heaviest rain in the south. 35.5% correctly identified this as the predicted weather with other responses fairly well spread over a further two options. The forecast issued to accompany the chart was *"A cloudy, rather cold day with rain, heavy at times, quickly spreading from the west during the morning and persisting for the rest of the day."*.

Question 6 showed the corresponding symbol forecast chart, for the same day and time, as issued by Weatheronline, predicted rain in the south, with sunshine and showers to the north. 48.9% correctly ascertained this from the forecast chart.

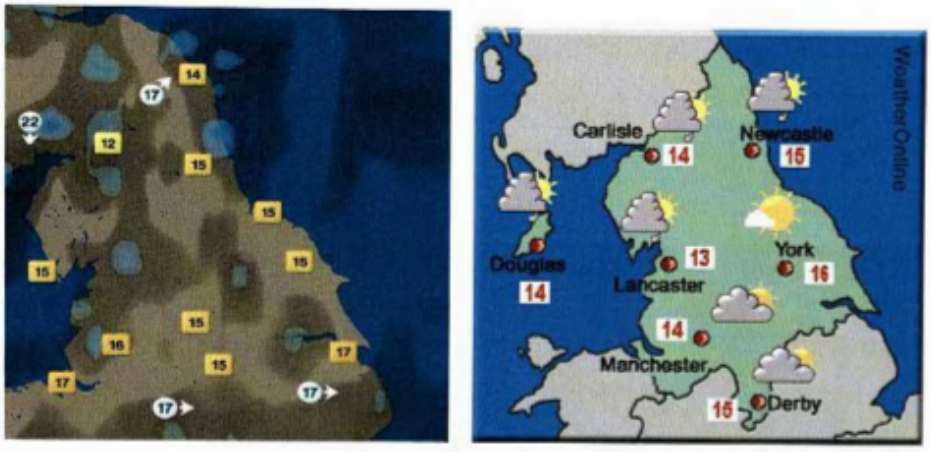


Figure 6.2 BBC contour chart (left) and Weatheronline symbol chart (right) as described in questions 7 & 8 of survey

Questions 7 and 8 focused on the weather of north and northeast England (Figure 6.2). In Question 7 the contour chart showed bright spells and showers affecting most of northern England, with the majority of the showers over the northwest and more scattered showers through Northumberland. 52.3% stated that the weather would be "Sunny spells and showers", a reasonable description given such a chart, although it should be noted that 25.6% did expect the weather to be "Mainly dry, an odd shower". The official forecast to compliment the graphics was *"A rather cloudy and showery day is expected with some locally heavy showers perhaps merging into longer spells of rain over the hills. Rather windy over the region."*

Question 8 showed the Weatheronline symbol chart. Respondents were presented with three options, all containing the word "showers"; Sunny spells and showers" returning the most at 34%, but closely followed, correctly, by "Showers for the west, sunny in the east" with 33.2%.

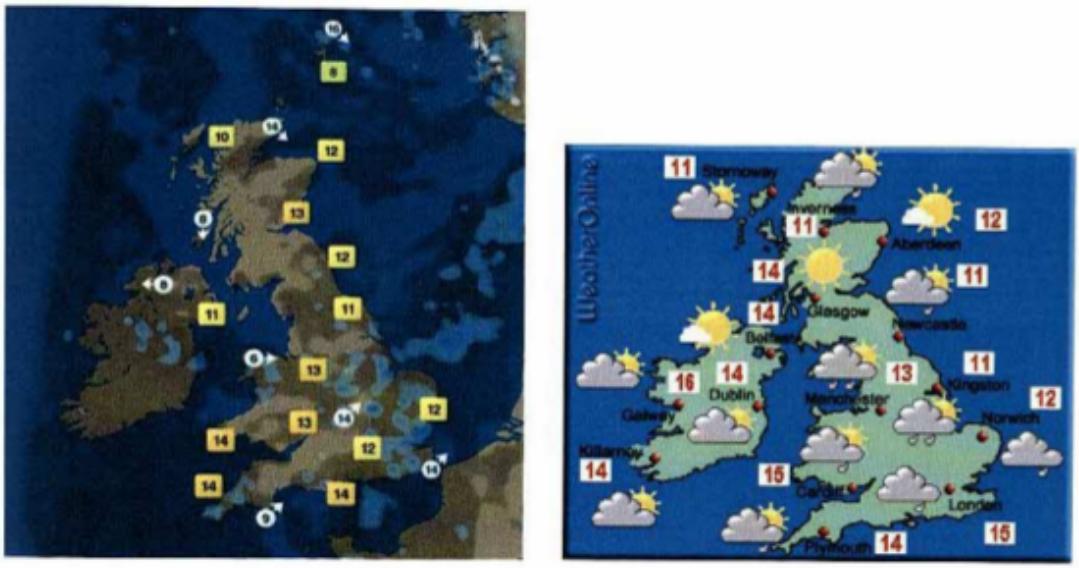


Figure 6.3 BBC contour chart (left) and Weatheronline symbol chart (right) as described in questions 9 & 10 of survey

Questions 9 and 10 related to how a viewer depicted the weather shown on a national weather chart, displaying the whole of the British Isles and Ireland (Figure 6.3). The contour chart returned a response of 61.8% to the option of "Cloudy and showery, but brighter in the north and west". However, although similar, the correct response was "Bright spells and showers in south, fair in north & west"; only 25.6% selected this option.

The Weatheronline chart in Question 10 was more accurately represented by the "cloudy and showery, but brighter in the north & west", and 64.5% correctly responded to this. 19.5% chose "Bright spells and showers in south, fair in north and west.

The official forecast for the day, as issued by the BBC Weather Centre was *"Northern Ireland and Scotland mainly dry with sunny spells. Scattered showers across England and Wales turning heavy and thundery, especially in central and eastern areas. Winds mainly light and variable".*

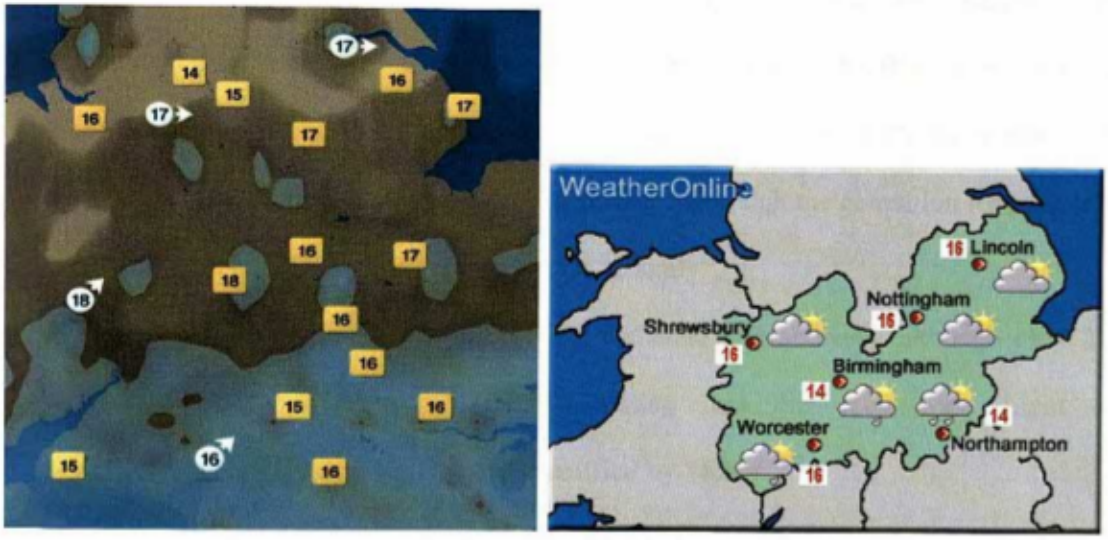


Figure 6.4 BBC contour chart (left) and Weatheronline symbol chart (right) as described in questions 11 & 12 of survey

Finally, in this section of questions, the Midlands region was shown. Caution is advised when determining results from these questions, as the geographical regions shown do not exactly correspond. Therefore, responses to the questions should not be compared.

Of the contour chart in Question 11 (Figure 6.4), 45.4% stated that there would be "Rain in the south, broken cloud and showers in north". A more accurate description was of a "Wet south, scattered showers elsewhere", with 19.5% selecting this option. This is a marginal decision and both may be deemed to be correct.

The symbol chart shown in Question 12 returned a better response of 78.6% for "Sunny spells, showers in the south".

The focus of the survey then became the symbol used on charts and outlooks. A selection of symbols were taken from the BBC and Weatheronline and shown singularly with a choice of eight answers. Henceforth BBC graphics are termed 'icons', while Weatheronline graphics are termed 'symbols'.

(Question 14) Sunshine was the first symbol shown, with 86.2% correctly responding. 12.6% said the symbol depicted "Sunny spells". The BBC icon for sunshine was identified by 80.5%, although 14.2% selected "Sunny spells". Interestingly, 3.8% thought that this symbol represented "Mist or fog", although the actual ion for mist and fog drew 39.5%, with 54.8% thinking this meant "Cloudy".

Next (question 15) was the BBC icon for sunshine and showers, although only 21.5% recognised this; the majority (60.9%) stating that this icon was "Light rain". Weatheronline's light rain symbol was identified by 86.6%

In question 16, the BBC icon for heavy rain was correctly identified by 95.4%, and a similar figure (95.8%) also correctly identified the Weatheronline symbol for heavy rain. Sunny spells as depicted by the BBC icon (question 17) was not as easily recognised with a response of 66.7%. In fact 24.1% thought this icon to be depicting "Cloudy" weather.

Thunderstorms (question 19) as depicted by the BBC were correctly identified by 91.2% , although this figure was lower for the Weatheronline symbol (question 23) at 82.8%, with 15.3% thinking that this was "Sunshine and showers".

When asked which method of graphical representation was preferred (question 13), the response was marginally in favour of symbols (54.2%), whilst 45.8% preferred contours.

Finally, those who answered the survey were asked to enter their comments and suggestions about existing television weather forecasts; 237 choosing to do so. A selection of comments is shown below.

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Finally, those who answered the survey were asked to enter their comments and suggestions about existing television weather forecasts; 237 choosing to do so. A selection of comments is shown below.

"Synoptic chart data (showing fronts and isobars) as well as an overview of what that means (showers, fog, sunny spells etc.)"

"Clear, regional information. Symbols talked through by a presenter...indication of timing of events."

"One that gives plain English forecast with little technical speak."

"Anything done slowly."

"Good definition of what is happening when. Clear graphics, including lows and highs to allow user to read between the lines."

"Customisable to a local location of choice, giving options on timescales and weather... Current forecasts are all rather too preset."

"As far as I am concerned, TV forecasts are too general."

"Concise and accurate!"

By far the most frequent comment made was that synoptic charts should be shown, detailing the movement of highs and low, as well as fronts. Regionality was also mentioned several times as was the need for the presenter to speak slowly. Overall, the BBC presentations were described as the best of television by several respondents, with Metcheck.com and XCWeather.co.uk cited as best for online content.

6.4 Weather Passive – Results

(Responses to these questions are shown in Appendix 8).

Unlike the Weather Aware survey, the Weather Passive group more accurately reflects the views of 'ordinary' television viewers. It was felt important to establish the demographic make-up of the group in order to ascertain viewing habits, age and educational background and this information provides a useful insight into the make-up of this group.

75 people agreed to be questioned about their gender. 53% were female, 47% male, indicating an even gender distribution amongst respondents.

When asked about their age, 35% were aged 30-39, 25% aged 20-29 and 17% 40-49, hence the survey reflected the views of a relatively young cross-section.

Educational achievement also attracted 75 responses, with 45% qualified to Bachelors Degree level, 28% to A-level and 13% to Masters Degree level.

The first four survey questions established how much the respondent to the question understood the more technical aspects of television weather charts.

Participants were then asked the same series of 23 questions as the Weather Aware group, and the same sequence of weather graphics were shown to them (see 6.3.1 above for images).

Surprisingly the results were very favourable. 95% of respondents correctly identified a warm front, with 87.2% able to identify a cold front. There was a little more confusion when identifying occluded fronts, but even this achieved a 56.5% recognition. Understandably troughs were harder to recognise, although even here 62.2% of respondents answered correctly.

The same questions were then asked of respondents, as in 6.3.1 above. Having been shown the BBC contour graphic Question 5 (Figure 6.1), 133 people responded. Of those, 34.6% correctly stated that it would be cloudy, with heavy rain in the south. The remaining responses were fairly evenly distributed at between 11 and 17%, although 5% answered *"brighter later, showery"*.

Interestingly, when shown the symbols chart of the same day (Figure 6.1) the 135 responses were much broader. 35.6% said that the chart represented *"Bright spells and showery"* conditions, which indeed in broad terms, was true. However, the chart showed heaver rain in the south and only 16.3% chose this option.

In response to Questions 7 (contours) and 8 (symbols), both questions drew a response of conditions likely to consist of *"Sunny spells and showers"*. 34.8% chose this option to Question 7 closely (considerably less than the Weather Aware group) followed by 31.2% choosing *"Mainly dry, an odd shower"*. Less visualised a forecast which one may consider incorrect. Question 8 related to Weatheronline symbols chart (Figure 6.2), and this attracted a good recognition rate of 92.3% of those responding describing a combination of sunshine and showers.

Question 9 (Figure 6.3) again attracted good responses from the Weather Passive group, to a situation which may be described as hard to interpret. 48.9% of the 130 respondents stated correctly that the BBC contour chart depicted *"Cloudy and showery, but brighter in the north"*.

In question 10 (Figure 6.3) significantly fewer Weather Passives (38.6% of 132 responses) chose *"Cloudy and showers, but brighter in the north"* than Weather Awares. 25% sad that *"Bright spells & showers n the south, fair north & west"* was a better option. Perhaps this was due to a confusion in the wording of the questions.

Similar responses were given by Weather Passives to questions 11 and 12 (Figure 6.4), as were given by the Weather Awares. The BBC contour chart did appear rather confusing and perhaps a little pessimistic, with only 37.4% assessing that there would be *"Rain in the south, broken cloud and showers in the north"*. 19.8% responded a *"Wet south, scattered showers elsewhere"*. The symbols chart was clearer in that it did show more sunshine. 73.1% of respondents stating the weather would be *"Sunny spells, showers the south"*.

The Weather Passive group were then asked to view individual BBC 'icons' and the more traditional Weatheronline 'symbols' (Questions 14 to 23) as shown in the survey results in Appendix 8.

When shown the BBC icon for sunshine, out of 126 respondents only 66.7% correctly identified it, although 29.4% did state that it showed 'sunny spells'. Compare this to 84.1% and 15.1% respectively correctly identifying the sunshine symbol used by Weatheronline.

Again the symbol used for 'light rain' by Weatheronline was far more broadly recognised (79.4%) than the BBC icon (56.3%). Some respondents understandably thought the symbol and icon referred to 'drizzle'. When these figures are added to the correct responses a recognition of 96.8% and 77.7% respectively emerge.

'Heavy rain' was well recognised using both icons and symbols. 90.5% identified the icon for heavy rain, with 94.4% identifying the symbol.

The most misunderstood icon amongst BBC graphics was that for fog. This was only recognised as fog by 33.3% of the respondents. 65.1% of people thought that this was the symbol for sunshine and showers!

When the thunderstorm symbols were shown 92.8% correctly identified the BBC icon for thunderstorms. However, the response for the Weatheronline thunderstorm symbol was 78.6%, considerably less recognition than the icon.

The Weather Passive group preferred symbols to contours, with 64.9% of 131 respondents saying they found the Weatheronline symbols most useful, and only 35.1% preferring the BBC contours.

As with the Weather Aware group, the Weather Passives were invited to leave their comments about what they wanted to see in a television weather forecast. Here are a few of their comments:

"Accuracy is most important, somehow offer more entertainment to make it interesting."

"Should be very clear and accurate with the information"

"Simple and easy to understand."

"One that tells you not just the next day but the next few days so that you can plan ahead more, they only tend to do this at on a Friday which, if you're trying to organise something for the weekend it's a little late!!"

"Get rid of the desert look on BBC"

"A slightly longer separate programme rather than attached to a news programme which always seems that the weather forecast is squeezed in."

"I want to know what's happening where I live. I don't care about the rest of the country and I always want a brief outline of 5-days and further"

"Clear and concise. Doesn't patronise. Detailed in the short term, but also gives longer range forecast and looks at trends."

Amongst the Weather Aware group the local nature of forecasts seemed to be most important. Several said that they would like the forecasts to be just for their area, and that they were not interested in what was going on elsewhere.

Many stated that they would like detailed forecasts for the next 48-hours, followed by an outlook extending to at least 5-days, if not further and several commented that forecasts should be concise and to the point.

6.5 Discussion and Conclusion

It is important that this survey is viewed in the context of being carried out amongst two distinct groups of users. Many of the Weather Aware group, for whom weather forecasts are an important part of their activities, will have undertaken weather training, usually as part of the Private Pilots Licence or Royal Yachting Association examinations. Some of the Weather Passives may also have had more than a passing interest in meteorology, but due to the random nature of the sample, it is taken that most would be an 'average' viewer with a broad interest in weather forecasts.

Future studies could explore the reactions of differing groups. It would be interesting to form a truly random sample group of weather passive viewers, drawn from

many differing areas of society and thereby removing the social and educational similarities inherent in this group.

Surprisingly both groups showed a good ability to correctly identify fronts, showing what an asset to television weather forecasts pressure and frontal charts can be. One would expect the Weather Aware group to identify fronts, but the Weather Passive group also showed a significant recognition of such features.

It has been stated (personal correspondence) that "most people do not know what pressure charts mean and that this can make such individuals feel inferior". The results of this survey suggest that this attitude to viewers is incorrect. It could also be argued that showing such features both educates (fulfilling the Public Service Broadcasters remit), and attracts more viewers with higher disposable income, and therefore encourages advertisers to spend more sponsoring a forecast (enhancing revenues for commercial broadcasters).

When interpreting the forecast maps, symbols charts consistently returned a better response rate than contours. However, this could be because symbols define one element of the weather, whereas contours offer more detail over the same geographical area and so therefore may be harder to ascertain what the details of the weather will be. There was very little difference between national and regional charts, with responses being similar. However, given the resentment to contour charts when first introduced by the BBC, the interpretation of them by both groups was good and better than expected.

What is more surprising, again given the resentment to the introduction of the new charts, is that amongst the Weather Aware Group there was so little difference between those preferring symbol charts and those preferring contours. This shows that the Weather Aware group at least are able to interpret the information given on the charts with little difficulty. Less agreement existed within the Weather Passives, perhaps this shows that it will take longer for most viewers to understand and interpret contour charts.

There was also little difference, given a couple of notable exceptions, between the identification of symbols or icons, again showing that the group are able to make interpretations of conditions accurately from the information shown, which will no doubt be welcomed by those designing graphic palettes for use on television weather forecasts.

However, it should be noted that sunshine is still poorly depicted by contour charts and this should be taken into account when weather graphics are being designed.

Given the similarities in some of the results discussed above, mainly amongst the Weather Aware, comments made by the viewers should also be considered when forming an overall view from these surveys. Amongst the Weather Aware these clearly state that viewers want to see more frontal charts. Both groups want a clear, non-technical, concise explanation of the weather forecasts on a local scale with a detailed short term forecast, together with a forecast for the next 5-days together with an extended outlook.

In conclusion, Weather Aware viewers do not mind whether graphics are shown as contours or as symbols provided that they are also shown pressure and frontal forecast charts. The Weather Passive group would prefer to see symbols used on forecasts and can identify fronts should they need to. How local a forecast is is important to both groups, as is the clarity and concise nature of the forecast presentation and it's relevance to their interest.

From these surveys one may summarise the requirement of a television weather forecast as follows:

Requirements for a television weather forecast

1. Concise, to the point and accurate
2. Specific to a local or regional area
3. Relevant to a specific interest, i.e. farming, sailing, flying etc.
3. Contain a detailed 48-hour forecast & a brief 5-day outlook
4. Fronts and pressure charts to be displayed

5. No preference between contours or symbols

Weather presentation designers can remember these as the mnemonic

LOCAL

Local

Outlook in detail for the next 48-hours

Concise, accurate & relevant

Analysis charts (fronts and pressure)

Look ahead to at least 5-days ahead

By following the guidance shown above television designers and producers can produce weather broadcasts that are relevant to viewers' requirements. However, such a remit is wide especially when attempting to make the forecast relevant to individual needs. Therefore, new methods of delivery, such as the internet and interactive television offer viewers the opportunity to 'create' their own weather forecast channel by choosing from the forecasts they wish to view.

CHAPTER 7:

ARE EXISTING TELEVISION WEATHER FORECASTS SATISFYING VIEWER REQUIREMENTS?

7.1 Introduction

Previous chapters have sought to establish the current position of the television weather forecast. It is now necessary to review these chapters and to ascertain whether viewers are receiving forecasts which satisfy their requirements.

The historical context of the visual forecast has been discussed and has been found to have made significant progression during recent years thanks to the advance in technology.

Existing television weather forecasts in the U.K, Europe and the U.S.A. have been reviewed using content analysis techniques. Bulletins were found to be similar and to have evolved to be symbiotic in their structure.

The surveys conducted in Chapters 5 and 6 contained questions designed to find out what viewers actually think of current weather bulletins in the U.K. and how much information they understand and can recall about a forecast. The responses to these questions, from two groups of users (Weather Passive and Weather Aware) have answered some of the research aims of this thesis and have also raised other questions which might be answered in future research.

This chapter revisits the questions posed in section 1.2, assesses whether the questions have been answered by the research undertaken, and suggests the next stage of development taking into account the knowledge gained.

7.2 Answering the Research Questions

The following paragraphs will consider each of the research questions posed in section 1.2.

7.2.1 What is the Ideal Length of a Television Weather Forecast?

Anecdotal evidence suggests that viewers often complain that forecasts are too short in length. As the research has suggested that viewers (especially Weather Passives) are poor at estimating the time a forecast has been on-air, it seems that this issue is actually less relevant to viewers than may be first imagined. The timing issue is likely to be more one of television stations devoting time to a weather forecast, rather than the length of time viewers would watch for.

Should viewers be presented with longer forecasts? Perhaps this should be explored by televisions stations as it may attract new audiences. Longer forecasts have always been perceived as being of less interest to audiences because viewers can only retain a certain amount of information. However, if regular headline graphics were introduced throughout weather bulletins, saying to the viewer, "Listen up, this is a new piece of information that may interest you", the viewer may be able to 'tune in' to only the sections of a forecast which are relevant to their requirements.

Those who are interested in the weather thought that generally weather bulletins were too short, whilst those who only had a passing interest thought they were too long or just about right. This shows the need for forecasts to be more targeted towards those who use them, with different users requiring different information from the forecast.

An opportunity exists for a television station to target viewers with differing weather forecasts. On-demand services make this a distinct possibility with there not being a need for broadcasters to include targeted forecasts in published schedules. Such forecasts could be made available online for the viewer to watch at their convenience. Viewers could also

choose to watch the forecast on mobile telephones or laptop computers when away from their base location.

7.2.2 How Much of a Television Weather Forecast can a Viewer Recall?

The immediate recall of the television weather forecast shown to respondents was generally good. Predicted weather and temperatures were well remembered by both groups. However, it was noted that more benign weather conditions (sunshine and cloud) were not so well recalled. This is understandable as most viewers will only be interested in 'real' weather, i.e. weather that will have a physical affect on them.

Further research could consider how forecasts are recalled and how much of a forecast can be recalled given a longer time period after viewing the forecast (i.e. 1-hour). When remembering forecasts do viewers visualise the forecast or do they remember it as a short summary of words, perhaps 'hot and sunny'? Such details could aid the design of forecast graphics and broadcasts to assure the maximum recall for viewers.

By assessing what viewers recall when watching forecasts, television stations could design weather bulletins to more accurately satisfy viewer needs. It may be that viewers better recall some parts of a bulletin depending upon how long they have been watching. For example, initial limited research has shown that male and female viewers watch forecasts differently; the male viewers assessing the 'attractiveness' of a female weather presenter during the first few seconds of a broadcast, while female viewers watch the same presenter and critically assess what she is wearing.

Such research could highlight when the most important points of a forecast should be included in a weather broadcast, perhaps also leading to offering sponsors better value from advertising before, after or during the broadcast.

7.2.3 Are Symbols or Contours Preferred by Viewers?

Very little difference has been found between those preferring symbols and those preferring contours. Both groups marginally preferred symbols, but not in sufficient numbers to declare that symbols are the only way to present bulletins.

The actually recognition of symbols and icons also showed little difference, although there were a couple of significant exceptions; sunshine and fog were better depicted by symbols than icons.

Overall both methods of weather depiction are accepted by the viewer, with both symbols and icons requiring education of the user in understanding what each graphic is portraying.

Given the controversy that surrounded the introduction on the BBC 'non-symbol' graphics, this is surprising. Contours do present more information to the viewer and are preferred by those with more than a passing interest in the forecast. This is possibly because of the amount of detail the forecast contains compared to more traditional symbolic portrayals of expected weather conditions.

Of course a television station must be careful not to alienate some viewers by presenting information which is not in a format they wish to see. Producers and weather graphic designers must therefore be aware of who will be watching the forecasts on their station, and what the preferred method of portrayal will be. It is likely that a combination of symbol and contour graphics will satisfy the needs of viewers of most television stations.

7.2.4 Is a Presenter Necessary for Conveying the Forecast Information?

Only limited research has been undertaken in this thesis regarding this question.

Interpretation of the data suggests that the presenter is necessary, especially when conveying the more important elements of the forecast, for example stressing extremities of the weather. A similar outcome may be achieved by the use of a voice-over. Further

research is required in order to establish a definitive answer to the presenter/non-presenter/voice-over question.

A presenter does enhance the branding of the forecast, and if they become a recognised personality can increase loyalty to the television station on which they appear. Confidence is an attribute that all presenters should convey. By feeling comfortable both with their own ability and the forecast they are presenting, the presenter should convince the viewer as to the confidence that may be placed in the forecast.

7.2.5 Is New Technology Being Used by the Audience to View Forecasts?

Users do seem to be embracing new technology (if the internet can still be regarded as 'new'). Both groups use the web as the main method for retrieving weather forecasts. This probably reflects the immediacy and relevance of the internet, and the local nature of the forecasts provided on it (down to postcode level).

Terrestrial television, what one might regard as the traditional medium for broadcasting weather forecasts, was the second most popular method of forecast retrieval for both groups. These forecasts are probably providing more detailed information to that gained from the internet, and are trusted by viewers.

What one might regard as the latest technology, broadcasts via mobile telephones, scored very low with both groups.

Should a company seek to develop a new service, perhaps one broadcasting via the internet, gaining the trust of terrestrial television viewers will make such a service more attractive to users. Internet services could be 'on-demand', enabling viewers to view the forecast when and where they want too. Of course, viewers might also like to know when such forecasts are updated and technology such as email or text alerts could be introduced to advise viewers when this has taken place.

A disadvantage of the internet is that such a service would become one of many. Maintaining repeat visits from viewers is a problem which many internet sites face. Alert viewers to updates of forecast may be one method of ensuring repeat visits although one has to be careful not to send to many emails and appear to be 'spamming' potential customers.

7.2.6 What is Television Weather Forecast 'Perfection', and has This Been Achieved?

This research shows that special and temporal relevance of a forecast to the viewer is key to achieving the perfect forecast. With so many differing requirements amongst viewers (some may require the weather for their wedding in six months, other a hot-air ballooning forecast for wind speed accurate to within 2 knots) the perfect forecast format is hard to achieve.

However, it may be that the perfect forecast format can be brought closer, and the forecast made more relevant to viewers by hosting special forecasts for viewer groups, i.e. a long-range forecast for the next six months or a forecast specific to hot-air ballooning. As discussed earlier in this chapter these forecasts, specific to individual activities could be accessible via on-demand services, such as the interactive red-button via Sky.

By offering such forecasts viewers would gain the immediacy and relevance of the internet, together with the trust established from a presented terrestrial forecast.

7.3 What Next for the Television Weather Forecast?

The weather forecast is now a long established feature of television broadcasts. Over the years it has evolved, from pre-television depictions of weather in paintings, to the advent of newspapers conveying weather information and on through broadcasts via radio and television, to the latest technology broadcasting information via the internet and to mobile telephones.

Today's viewers clearly require weather information at a time they want to view it. The internet provides this, but is it trusted by users or do users simply use the internet for fast access to weather information and then back this up by referring to forecasts from the more traditional terrestrial sources such as television or radio?

Clearly there is an opportunity for both user requirements to be satisfied in the creation of an internet site which provides viewers with immediate access to postcode forecasts, but also gives more detailed presented forecasts in a more traditional television style.

The research shows that forecasts should be relevant to particular user groups (pilots, sailors, climbers, farmers etc...), and so a channel dedicated to each of these interest groups could be established.

Length of each of the broadcasts can be determined by the information required by each of the groups and not constrained by the requirements of existing television weather forecasts to satisfy the needs of the majority of passive viewers.

Chapter 8 explores how such an internet based weather channel could be established, and suggests marketing techniques and a financial model necessary to make such a channel a success.

CHAPTER 8:

DEVELOPING AN INTERNET TELEVISION WEATHER CHANNEL

8.1 Introduction

It has become evident from the research undertaken within this thesis that there is a need for an enhanced broadcast weather service, more satisfying to the needs of viewers, whatever their motivation for watching (see the discussion at the end of Chapter 4). 71.5% of 446 people questioned (both Weather Aware and Weather Passive groups) stated that they would be likely to watch a television weather channel broadcast through the internet. Of these 61.3% said that they were likely to watch such a channel between one and three times in a typical day.

Technology now enables viewers to create their own television channels, and there is no longer a requirement to broadcast using expensive terrestrial or satellite based networks. The internet has enabled web based television services to become a reality, and as discussed elsewhere in this thesis, a new generation of television now exists in which the broadcast method is unseen by the viewer. The weather lends itself perfectly to being adopted to for use with digital technology.

As with any other business, the Channel would have to generate enough revenue to support itself over the coming years, as homes switch to digital television technology and/or users become familiar with having forecasts delivered and viewed via the internet. This would be achieved through maintaining a low cost base whilst income is attracted to the service through advertising. The internet enables a channel to be built that will contain several data streams on one screen, similar to those seen on financial chancels such as Bloomberg and CNBC (see Figure 8.1).

The responses to the surveys shown in Chapters 4 and 5 of this thesis demonstrate that delivering forecasts and information that viewers want to watch will be crucial for the

Channel's success. By encouraging viewers to regularly watch the Channel for their weather forecast information advertisers will be more willing to further invest in the channel by providing more paid-for sponsorship and advertising.

Figure 8.1 An internet weather channel could appear similar to financial broadcast, with local weather information, adverts and presentations within one screen (Bloomberg 2008).

The broadcast method priorities for the channel will be as follows:

1. The internet
2. Mobile telephones
3. Complimentary on satellite television channels

8.2 Why an Internet Television Weather Channel?

Advances in technology have significantly reduced the costs involved in broadcasting weather content with the internet now playing a leading role in delivering content to the user. An internet company, primarily providing presented on-demand weather bulletins would also be able to broadcast via mobile telephones and, if required, standard television. In addition to visual broadcasting other mediums could be catered for including radio. Articles and statements about the weather and issues relating to the weather and

climate change could be written and made available to other media providing cross-promotions.

Technology is now moving beyond that of a base PC which requires dedicated work stations comprising a minimum of keyboards, monitors and base units. Increasingly other products are being used to view and listen to forecasts. TV/PC combination packages (i.e. Philips Living Room PC & HD TV) are now being marketed by retailers at prices that are within reach of most consumers and prices are expected to fall during the coming months and years. 2007 has seen the widespread introduction of 'digital media streamers' which enable one to watch video and music, streamed from an ordinary PC to a standard television via a wireless network (PC World 2007).

Viewing habits are changing as viewers become familiar with using interactive features such as the 'red button', and by viewing on the internet. Recent reports from Ofcom have suggested that increasingly minority groups are choosing not to view terrestrial television (see http://business.guardian.co.uk/story/0,,2108806,00.html).

Television weather channels are starting to see a resurgence in Europe. One has recently been launched in the Netherlands by Meteogroup and another, web based channel has been launched by Weeronline.tv. Both of these channels are in Dutch although it is understood that channels are being developed for broadcast in English.

As the research in Chapter 3 has shown, most viewers expect to use standard television to view forecasts in the future. This may be down to a lack of education as to the services that are available, a lack of penetration of digital; television, or the trust that has built up over the years in weather forecasts broadcast via terrestrial television. One of the greatest challenges to an internet based weather television channel will be using advancing technology to overcome such barriers to viewing.

8.3 What is the Market for an Internet Television Weather Channel?

Before such a channel could be launched it would be necessary to establish whether there is a need for the service. The research carried out elsewhere in this thesis suggests that the demand from potential viewers is present and that such a channel would have sufficient audience to become a success. However, this could only be achieved through careful financial management, especially given that there are many other television stations broadcasting weather forecasts in Europe and the United Kingdom.

The research in Chapter 3 of this thesis shows that television is the method by which most people get weather forecasts, and is also the method by which they expect to retrieve weather forecasts in the future.

Until the early 1990's television relied on terrestrial television stations broadcasting to consumers, weather forecasts and other programmes at a pre-scheduled time.

Satellite television then offered viewers an alternative to terrestrial broadcasters by providing weather forecasts (through Sky News) at regular half-hourly intervals. However, viewers still had to be watching television at a particular time and broadcasters relied on households having access to satellite television, which many did not.

As digital satellite broadcasting became available during the early part of the 21st Century viewers began to get some choice as to what they watched and when they watched it. Pressing the 'red button' became familiar to many and enabled viewers to watch forecasts when they required. However, these broadcasts were, and are still fairly long and the method of watching is cumbersome.

Web television is now offering a completely new method of viewing through a television with content delivered through a web site, and/or a mobile telephone. Within a few years it is predicted that viewers will be able to 'build' their own television channel via such mediums. Some of these channels will be broadcast by satellite or terrestrial broadcasters, others will be provided online over a wireless connection. However, to the

viewer, the difference between the two will be seamless. The method of broadcast will become irrelevant. The Philips Living Room PC and TV Package is the first step in creating a complete entertainment system based around the television. Creating ones own channels will become an everyday experience during the coming years.

Other platforms are also offering the ability to integrate television, internet and gaming. Fore example The Nintendo Wii games console includes a web browser and wireless connectivity. Using a Wii console one can view videos via the web, on a standard television very easily. Therefore, by providing content that can be easily viewed through such technology, access to a wider audience can be achieved. It may also be that those using gaming consoles are less likely to watch 'standard' television programming and so a new genre of viewers could be introduced to the weather forecast.

8.4 The Positioning of an Internet Weather Channel in the Television Weather Market

As a unique product, a multi—media weather channel will be ideally placed to build market share rapidly and to offer value to advertisers and sponsors. With the correct publicity the Channel should become the de-facto weather forecast channel very quickly, with content providers eager to include content via their own platforms.

There are some services which are currently offered via mobile telephone such as the ITN weather service. This service provides is a voice-over of weather graphics of the UK although the viewer does not have a choice of which forecast to watch, or indeed when to watch.

Standard websites do offer major competition, although the Channel will offer web viewers something extra to what they may get from searching a web site for weather information. When viewing a standard weather website a viewer can only interpret graphics, or a limited amount of text. They cannot be sure of the provenance of the data they are being

shown. It is important that the internet weather channel provides both presented, text and audio content as well as building viewer confidence and trust.

Local forecasts, specific to the tasks viewers are undertaking should be a major part of the Channel. 'Local' was a phrase many respondents used during surveys, and they frequently referred to their own requirements. Whilst it is not possible to forecast for every location which may be of interest to a viewer, it should be possible to forecast for major towns and cities.

An important element of the internet weather channel should be to enable the viewer to design the Channel to reflect their needs. So, for example, a farmer would be presented first with a farming forecast and detailed conditions of wind and rain for the coming hours and days. At specific times of the year attention could be focused onto particular aspects of farming. Crop and cattle prices may also be displayed.

Other specialist groups may include walkers, aviators and sailors and these groups are more likely to watch than those with a passing interest in the weather, as shown in the survey results below. Each of these groups could be offered additional content and a 'look' that is specific to their requirements.

By offering more specialist forecasts to a narrow group of users, the Channel may be more attractive to sponsors by offering advertisers a direct route to the users.

8.5 Who Would Watch an Internet Weather Channel?

During the surveys undertaken for Chapters 3 and 4 of this thesis, an additional series of questions were asked of respondents to determine their response to the idea of a television weather channel broadcast through the internet. The groups were not shown any samples of such a Channel in operation.

It is important when reading this section to reflect that there were significantly more responses from the Weather Aware group than from the Weather Passives. This is due to sample sizes rather than a reluctance by the Weather Passives to respond. The results are given in the paragraphs below.

Respondents were asked initially whether they would watch a television weather channel broadcast through the internet. Of the 446 who answered the question 71.5% said that they would watch such a channel, 18.4% replied that they would not watch and 10.1% did not know.

This question also revealed that 77.4% of the Weather Aware group would use the channel in contrast to 42.7% of Weather Passives. However, Weather Passives had a significantly higher number of 'Don't Knows' with 22.7%.

Those who responded that they would watch were then asked how many times in a day they would likely tune into the Channel. There was close agreement between Passives and Awares with 61.3% of the total of 333 who responded stating that they would watch between once and three times each day. 32.7% estimated that they would watch the Channel once each day (this figure was 3% higher amongst the Awares (33.1%) then the Passives (29.7%).

It was then felt important to ascertain the age of such viewers. Most (36.0%) of the 441 respondents were aged between 50 and 59 years, with 23.8% at 40 to 49 years and 19.9% aged over 60 years. Therefore 55.9% of the audience of the channel would be over 50 years.

The survey also revealed that most of the 446 respondents are educated to at least A-level (91.4%). Of these 36.1% have degrees with 15.2% possessing Masters Degrees. 57% of the total are educated to degree level or higher.

Most of the respondents in these surveys were male (84.5%), although this figure is manipulated by the overwhelming male response from the Weather Awares (92.1%). When looking at only the Weather Passive responses, 47.3% were male.

In summary an internet weather channel would present a very attractive proposition to potential advertisers. The bullet points of the results of this survey are:

- The Channel should be geared towards specific user groups
- Viewers will watch more than once, mainly between 1 and 3 times daily, a welcome feature for advertisers to offer repeat adverts
- Most viewers (55.9%) would be aged over 50
- The majority of would-be-viewers would be well educated (57% to degree level or higher), offering high income purchasers to advertisers

The results shown above reveal that there is a requirement for an internet weather channel and that therefore the channel could be built as a working concept and begin broadcasting almost immediately.

8.6 The Goals of an Internet Weather Channel

Strategic positioning of the Channel would be key to its success. It would need to quickly become established as the defacto source of reliable weather information. The objective would be to build a product which can prove itself financially and make itself attractive to others in the market who may wish to create a weather channel, thereby discouraging them from attempting to launch a similar product.

By ensuring that press releases were issued when severe weather was forecast, or commentaries offered on issues of substantial public interest, such as climate change, the Channel could gain welcome publicity, raising its profile quickly.

Milestones in the company's development should be clearly established to enable an assessment to be made of progress during the early months. These could include:

1) Recruitment of key staff
2) Creation of the company, refinement of business plan and marketing strategies
3) Launch of operational website
4) First successful transmission
5) First month of successive broadcasts
6) Attraction of paying advertisers
7) 3-months broadcasting
8) Attraction of an offer for take-over

8.7. Competitors in the Weather Broadcasting Industry

Weather broadcasting is a competitive industry, but as has been shown throughout this thesis, weather broadcasts tend to be generic in catering for all viewers. Terrestrial and digital broadcasters provide weather forecasts via standard television, as do a small number of internet sites, most in Europe. Some organisations also provide weather broadcasts by mobile telephones

Indirect competition is given by newspapers and radio, which according to the survey results in Chapter 3 still provide many readers and listeners with a source of weather information.

8.8 What Would Make an Internet Weather Channel 'Different'?

The proposed internet weather channel would be unique in being an English language weather channel broadcasting within Europe. Forecasts would be focused on the UK and Ireland, but also for Europe and, as such, would have no direct competition. The

evolution of the Channel could be to offer several channels within one, each with an emphasis on a European country or region and, subject to financial constraints, could broadcast in several languages.

There are other television weather channels, notably one recently launched in the Netherlands by Meteogroup. This broadcasts through cable television and only within the Netherlands, although it does show an intention by Meteogroup (a European private weather company) to launch such channels.

Weeronline, a private weather company based in the Netherlands, has responded by launching an online only television channel. This is a service in Dutch and can be seen at www.weeronline.tv. Forecasts are for the Netherlands only and presenters are meteorologists.

The BBC also offers an on-demand weather service via the BBC website at www.bbc.co.uk/weather . This is updated regularly through the day, forecasts lasting up to 3-minutes. Only a whole UK forecast or a World forecast is available. The videos do not play on games consoles and it is necessary to download software in order for the forecast videos to play. However, this may be a temporary issue which could be overcome.

Standard television provides the main competition in terms of viewer numbers. However, it must be noted that the Channel would be positioned to be available to viewers when and where they require. The Channel should provide flexibility and target audiences directly with a changing wheel of programmes depending on the time of day and day of the week.

8.9 Meteorological Requirements

All of the information required by the Channel meteorologists is freely available via the internet.

Observational data from worldwide weather stations is available on a 3-hourly basis, with hourly observations being made by many. Such data for the British Isles and Ireland, as well as most of Continental Europe is available hourly, or more frequently for some locations.

Severe weather warnings would be received from the Meteorological office and displayed on screen in a special area of the website. These would be constantly updated, when appropriate so that viewers can be immediately aware of any severe weather that is likely to affect them and their activity. Note that the Channel would not issue severe weather warnings itself in order to maintain consistency for the public and confidence in the warning system.

Satellite and radar data for the British Isles is updated every 5-minutes, with satellite pictures available on a thirty minute update cycle. Note that radar and satellite would not be used on air initially, as the cost of broadcasting such information is considered too great at the present time. However, meteorologists could 'draw' areas of rain on maps to represent the areas where rain is falling.

Forecast data is generated from several models, with meteorologists having access to these. Operational models include the GFS (updated 4 times daily), GEM (2xdaily), ECMWF (2xdaily), UKMO (2xdaily) and DWD (2xdaily). The GFS Ensemble is updated 4 times each day, with the FNMOC Ensemble being updated twice daily.

High resolution short term forecasts would be obtained from Fifth Generation Mesoscale Model at the Air Force Weather Agency. These forecasts are updated 4 times daily and a based on a higher resolution model of Europe.

A climatological database will be maintained, thus providing information necessary to compare existing conditions with those of previous weeks, months and years.

By using the above meteorological data, the Channel's meteorologists will have access to the very latest past, present and forecast information. They will be able to amend

forecasts at short notice and can maintain the credibility of the Channel in providing the most up-to-date weather information.

8.10 Content of the Channel

Whilst it should be remembered that the flexibility of the internet would allow the user to build a channel which is focused to his particular needs, a more generic 'main' channel would be offered which would focus on the requirements of different users throughout the day, as shown in Table 8.1.

Each show would be recorded at differing times through the day, and would be updated regularly. The details for each of the shows are shown in Table 8.2. The update times are colour coded (as shown next to 'headlines') in order to assist in assessing when a forecast would be first broadcast. Durations are suggestions only and these could be changed to suit daily, depending upon a weather situation. Each forecast would be preceded, and possibly succeeded by a short advert.

Of course, viewers would need to know when the forecasts are going to be updated as the viewer will not watch the Channel continuously waiting for the update to be online. By providing viewers with text and/or email alerts they can be told when the forecast has been updated. Viewers could also select when they were alerted, for example some may only want to know the weather at weekends and so would not want to view a forecast every day.

Alerts of this kind provide a double benefit to the station by building customer loyalty, encouraging recognition and strength of the Channel brand and reminding customers that the Channel is on-air, encouraging them to visit regularly and watch the forecasts.

Weekdays	
0400-0600	Business traveller
0600-0900	Off to work and school
0900-1100	Days out
1100-1500	Home service, for those at home during the day, perhaps gardening or enjoying a few days off work.
1500-1900	Drive time, the journey home, targeted to those viewing from work.
1900-0400	Tomorrow's another day, for viewers who are home and need to check out tomorrow's weather.
Saturday	
0400-2400	Focus on the weekend ahead
Sunday	
0000-1200	Today and next week
1200-1900	The week ahead and business traveller
1900-0400	Tomorrow's another day, a look ahead to tomorrow's weather

Table 8.1.Highlights the differing users of the Channel by hour and day

Show Title	Update Times	Duration (m:ss)	Validity	Graphics
Headlines	Morning Mid-morning Afternoon Evening	0.3		Any
Euro Traveller	0500	2.00	Today Tonight	Today Tonight
	1200	2.00	Tonight Tomorrow	Tonight Tomorrow
	1800	2.00	Tomorrow Day after	Tomorrow Day after
Hot or Not Holidays	0600	2.00	Today Tomorrow 5 day outlook	Today Tomorrow 5 day outlook
	1600	2.00	Today Tomorrow 5 day outlook	Today Tomorrow 5 day outlook
	1900	2.00	Today Tomorrow 5 day outlook	Today Tomorrow 5 day outlook
The Day Ahead	0500	2.00	Today	SE, SW, Wales, Midlands, East Anglia, N. Eng, Scotland, Ireland
	1000	2.00	This afternoon	SE, SW, Wales, Midlands, East Anglia, N. Eng, Scotland, Ireland
	1400	2.00	Tonight	SE, SW, Wales, Midlands, East Anglia, N. Eng, Scotland, Ireland
	2200	2.00	Tomorrow	SE, SW, Wales, Midlands, East Anglia, N. Eng, Scotland, Ireland
Long Ranger	0530	1.30	Tomorrow	UK
	1730	1.30	D+2	UK
			D+3	UK
			D+4	UK
			D+5	UK
			D+6-10	UK
Farming Today	0600	2.00	Today Tomorrow	Now Precip Wind

	1200	2.00	This afternoon Tomorrow	Now Precip Wind
	1600	2.00	This evening Tomorrow	Now Precip Wind
	2000	2.00	Tomorrow	Precip Wind
Farmers Outlook	0600	4.30	Tomorrow D+2 D+3 D+4 D+5 D+6 D+7 D+8-14 if poss	Satellite Pressure Precip Wind
Sailing	0630	3.00	Today Tonight Tomorrow D+2 D+3 D+4 D+5 D+6 D+7	
Flying	0700	3.00	Today Tonight Tomorrow D+2 D+3 D+4 D+5 D+6 D+7	
World	0700	2.30	Today Tomorrow	Today Tomorrow
	1700	2.30	Tomorrow Day After	Tomorrow Day After

Table 8.2 Suggested forecast update times and content

8.11 Conclusion

By providing an internet weather channel via the internet, as proposed above, viewers would have a unique facility allowing access to the latest forecasts, specific to their requirements. Advertisers would be attracted to the Channel through the ability of the Channel to offer targeted advertising to specific user groups, thereby increasing the cost effectiveness of advertising campaigns.

Utilising up-to-date technology the Channel could maintain relations with viewers through text and email messaging, building trust in both the Channel and the forecasts broadcast on it.

The financial predictions provided in the Appendix are realistic and show that a television internet weather channel could become profitable within the first eighteen months of operation, returning a profit of £36,000 in year 2, following a loss of £108,000 in year 1. However, the company would not have cleared all debts until the end of Year 3, when total profits still show a £12,000 deficit.

Initially the company would need to attract approximately £150,000 of funding. Maximum indebtedness of just over £117,000 is shown in the early months of year 2. Additional investment would secure the company should sales not be as forecast or other unforeseen circumstances arise.

Investment in the Channel would be medium to long term for most investors, although it is envisaged that the company would be approached by another company in order to take over the running of the Channel and supply additional funding. By year 4 the Company could return profits in the order of £100,000 or more. With the addition of other revenue streams these profits could be further enhanced.

CHAPTER 9:

CONCLUSION

9.1 Thesis Summary

Television broadcasting is undergoing a revolution, as digital technologies enable viewers to choose when and where they will watch programmes. The internet is providing a new outlet for broadcasters, offering phenomenal opportunities to attract new audiences, but also posing a substantial threat. Broadcasts are no longer restricted to the geographical footprint of analogue radio transmitters or a satellite, but can be transmitted into any region in the world where there is internet access.

This thesis is unique in assessing the current state of television weather forecasts in the United Kingdom and suggesting ways in which improvements might be made, by embracing viewer requirements and new technologies.

Visual weather forecasts have evolved through history. Tracing the visual depiction of the weather back to the severe winters of the 1400's has revealed how humans have always been interested in aesthetic value of the weather, even when the image being painted would not be available for viewers until several months after the event. The advent of newspapers enabled weather information to be conveyed to viewers far more quickly. Weather reports and forecasts were conveyed to viewers mainly in textual format, but also using simple illustrations, then from 1903 stories could be enhanced with photographs.

Newspapers were the only method of conveying pictorial weather information to users until weather forecasts were introduced to television in 1936. By the 1990's the internet was paving the way for the next stage of visual weather depiction by providing a means of broadcasting forecasts directly to users computers, televisions and mobile telephones.

Of course, broadcasting of the information is only one part of the story. As with any service, it is necessary for the audience to want to view the forecasts, and to perceive that they are gaining benefit from watching them, whether that be in the form of entertainment or in making their lives easier.

Research carried out for this thesis has shown that, overall, viewers are happy with the format presented to them by existing television weather bulletins, and forecasts transmitted via terrestrial broadcasters are still very popular. Viewers are not concerned as to whether information is portrayed by graphical contours (such as the BBC), or using the more traditional symbols (such as Weatheronline).

Viewers' understanding of the weather story is good, and television stations do not give viewers credit for understanding more complicated weather information such as fronts or areas of high or low pressure.

The internet has provided a new outlet for weather forecasts, and this is one that is being used heavily by viewers. Most are using simple forecasts provided as text or symbols charts, with very few watching forecasts online or through mobile telephones. This provides a unique opportunity for a service to be developed which encompasses the trust viewers have in forecasts made via terrestrial broadcasters, and the immediacy of the internet.

9.2 Weatherweb.TV

It was been suggested in Chapter 8 that a service be established which satisfies the needs of viewers by delivering information via the internet, yet preserves the qualities of forecasts which they watch on terrestrial television. This is delivered by an internet weather channel which enables viewers to 'tune' the Channel to their particular needs. For example, sub-channels would be created for farmers, sailors, pilots, holiday makers or business travellers.

By broadcasting to mobile telephones users could access forecasts when away from desktop computers, and as televisions become entertainment centres, the internet will be integrated. Users will be able to create custom channels with little regard for what transmission method is used to deliver the 'show' to their television screen.

Such a service has been established via an internet site on a trial basis by the author in February 2008. Called Weatherweb.TV, the service initially offers forecasts, updated daily to specific user groups; farmers, sailors and aviators. Forecasts are provided free of charge with advertising revenue maintaining the site (Figure 9.1).

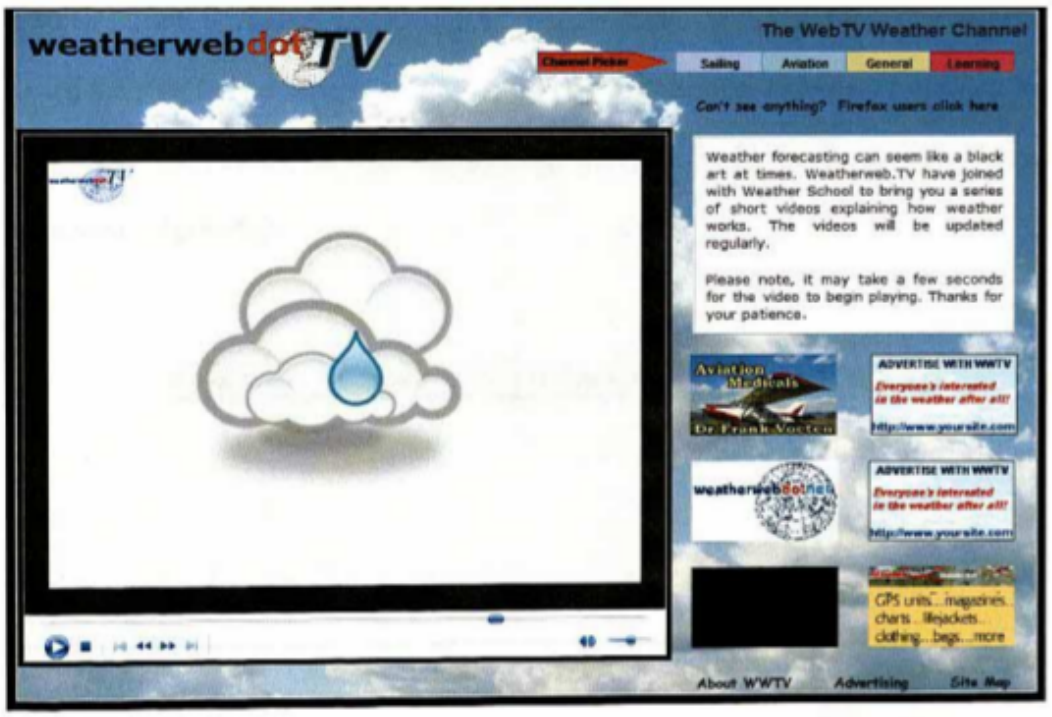

Figure 9.1 The Learning Channel at Weatherweb.TV

Early viewing patterns are now available and are showing some interesting results. Obviously, Weatherweb.TV is very new as this thesis is completed in May 2008 and the service has only been promoted via three newsgroups and the mailing list of sailors and pilots available to the author.

However, the service has attracted several visitors who have begun providing feedback to it. Most of the feedback has been positive with the most frequent negative being that technology is not available on some computers (mainly Mac's) to support the Windows Media Player format. This is however a relatively minor problem and one which is experienced by few viewers.

Of notable interest are the daily fluctuations in the number of viewers of Weatherweb.TV. Forecasts are updated daily by midday. However, on days when an email is released, or a news group message placed effectively promoting the fact that forecasts have been updated, the hit rate to the site doubles. This is well demonstrated by studying the period between Friday 1st August and Friday 8th August 2008. On Wednesday 6th August 55 people visited the site, but on Thursday 7th August 418 visitors were recorded, following the issuing of an email promotion message, and postings made to forums advising that forecasts had been updated (Figure 9.2).

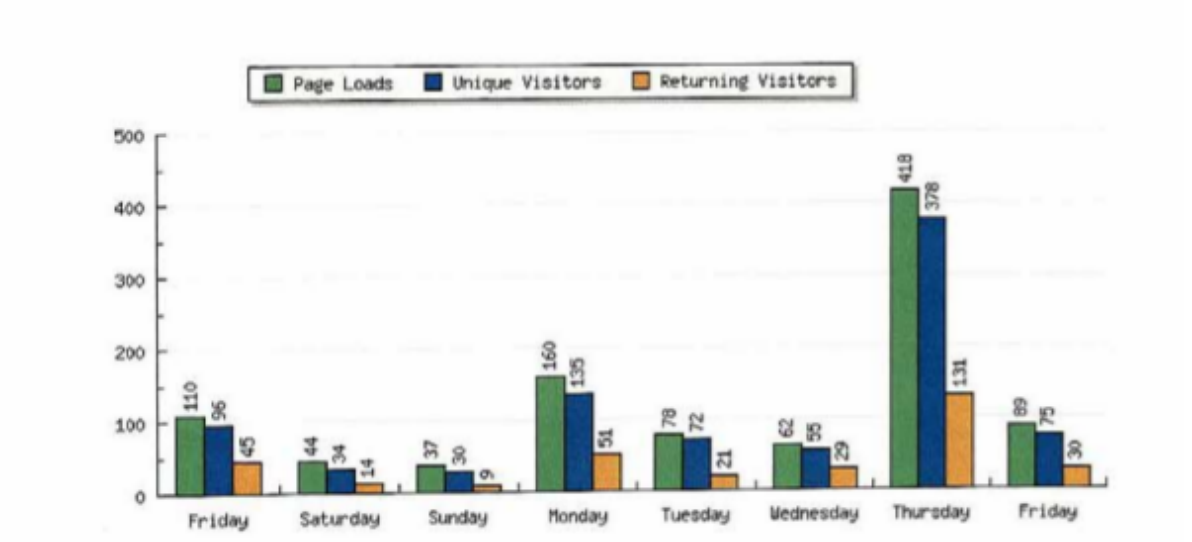

Figure 9.2 Visitors to Weatherweb.TV 1st August to 8th August 2008 showing a peak on Thursday 7th August after promotional messages issued by email and forums

With such varying daily hit rates a method needs to be devised whereby visitors are more likely to visit the site. This may be the inclusion of some additional, regularly updated

information, such as a 'crawler' similar to that used on financial television channels. Alternatively it may be that a briefer version of videos are made available for free to websites, which then link back to the main Weatherweb.TV page for more detailed forecasts. Sponsors would still be able to sponsor the forecasts available via other sites and hence revenues would be maintained. However, this solution does have the disadvantage of diluting the uniqueness of the site.

Overall the penetration of the site is very good considering it is less than 3-months old in May 2008. By studying the number of viewings of the 5-Day Aviation forecast, which is aimed specifically at leisure pilots who fly light aircraft it is seen that 1034 individual pilots accessed the site in April 2008. Comparing this figure with that of the Aeronautical Information Service (AIS 2008) which is a service advising pilots of hazards to flight, all pilots access this service before flying. The usage statistics for the AIS website show approximately 1750 pilots viewed the website each day in April 2008. Therefore Weatherweb.TV can be estimated to be reaching 60% of pilots who use the internet for briefing. Such a penetration figure in the early stages of a site will be attractive to sponsors.

Weatherweb.TV is continuing to develop and is now offering mobile videos via the video streaming website YouTube.com. Other hosting facilities are also being investigated.

At the present time Weatherweb.TV is considered to be still in a beta phase and will be so for the foreseeable future. However, it is proving the need for on-demand weather forecasts targeted at specific markets. Challenges facing the site include the maintaining of daily updates, the sale of advertising and sponsorship of both the site and bulletins and the increase of repeat, daily visits without the need to send emails or post messages on newsgroups.

9.3 Future Research

This thesis has shown how limited research into broadcast meteorology has been. This is surprising given that television and now the internet are the methods by which most people will retrieve weather forecasts.

Future research should concentrate on providing viewers with the information they want and need as technology advances, and also offering television stations the ability to maximise returns for sponsors and/or licence fee payers.

This can be achieved by breaking down the ways in which viewers watch forecasts. The focus should be on the attention span of the average viewers and the points within a forecast where attention may decrease. By knowing at which point in the forecast this is likely to occur the producer can build in various signposts which would capture the viewers attention once more.

New technology provides challenges not previously seen in broadcasting. Instead of fixed television schedules dictating to the viewer when a forecast would be available to see, viewers can now choose when, where and how to view such forecasts. The BBC and ITV are now both offering such facilities for viewing via their respective web sites. A focus for research could be on how these services will develop in the coming years and where, when and how viewers want to view them. Do viewers want presented forecasts of very local weather, or do they prefer a presented overview and the ability to select local weather delivered in a text or graphical non-presented format?

It could be that virtual presenters could present very localised weather forecasts. Technology is available which makes a presenter appear to 'speak' the forecast including the correct intonation and emphasis in speech. Would viewers trust such a development or are human presenters what viewers require?

The author believes that viewers will want forecasts specific to their needs and accessible when they want to view, either on a self-created channel via television or video

via mobile telephone. Of critical importance will be the targeting of specific user groups such as those selected by Weatherweb.TV. Although some of these user groups may be small they represent significant value to those funding the weather forecast, and enable less profitable yet larger groups such as general viewers, to remain financially attractive to the business.

Whatever methods of transmission and display develop over the coming years, viewers will always want the weather forecast broadcast visually and communicated effectively.

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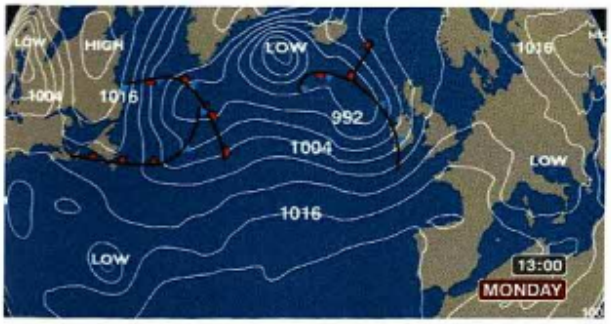
* denotes data is commercially sensitive and highly confidential.

APPENDIX 1:

A selection of images used during the content analysis




Wednesday
6 am
10
17
17
16
12
16
17
18

APPENDIX 2:

Questions asked during the content analysis of each weather broadcast. Scores were given for each answer.

1. Was the forecast presented or non-presented? (1,2)

2. Is the forecast presented as a geographical representation or non-geographical, or both? (1,2,3)

3. What period does the forecast cover <12hrs, 12-36hrs, 36+? (1,2,3)

4. Was the presenter male or female ? (1,2)

5. Is the presenting style formal or informal ? (1,2)

6. Is the dress of presenter formal or informal ? (1,2)

7. During the bulletin was there no text, all textual information or both textual and graphical information displayed (not including temperatures)? (1,2,3)

8. Did the forecast mainly consist of symbols, contours, pictures, or art (computer generated graphics) ? (1,2,3,4)

9. If used, were map projections tilted or flat ? (1,2)

10. Did the map animate (i.e. the BBC "country tour") or static ? (1,2)

11. Were symbols/contours animating or static ? (1,2)

12. Were webcam images displayed during the forecast ?

13. The next question relates to the information contained within the weather forecast bulletin.
Information contained within the forecast (0,1):
Cloud
Rain
Temperature
Isobars
Pressure centres
Fronts
Satellite
Radar
Air quality
U.V.
Interpretative information graphics (story telling)
Jet stream

APPENDIX 3:

Transcript of Midlands Today weather forecast as described in Chapter 4.

Kay Alexander: "Simon Keeling, who I am sure is a walker...has got the answer"

Simon Keeling: "I wish I could say I was Kay, I really should do some more shouldn't I?"

"It looks as if it is going to be unsettled for the weekend I am afraid, we've got low pressure coming in; but it is still going to be staying very mild for this time of year.

Let me show you what's going on. That cold front moved through during the course of last night and brought some showery outbreaks of rain but you'll see as I run the sequence into the weekend low pressure starting to form over western parts of Ireland. By Sunday that's starting to push its way northwards and that *really dominates* things. See these blue puddles here they're rain on its way to the Midlands for the course of the weekend; I think it will probably be showery rather than anything too persistent.

Of course we don't care what tomorrow's weather's doing really do we? Saturday and Sunday's what we want to know about. This is how it looks; yes we'll see rain for most of our towns and cities through the course of the weekend, but you can see temperatures not bad, 18 or 19 degrees Celsius is getting up to around 64 to 66 Fahrenheit.

This is how things look for today though. Lot's of cloud around, one or two bright spots perhaps just coming through here and there, and it will feel very warm in that sunshine too. Top temperatures around 19 Celsius, that's up to 66 degrees Fahrenheit, quite a brisk south-westerly breeze blowing.

For tomorrow...sorry for tonight, some outbreaks of rain coming through. Rather a lot of cloud around too and there may be some misty spots by the morning; bits and pieces of drizzle rather than anything persistent. Lowest temperatures 15 Celsius, 55 degrees Fahrenheit.

And a quickly look ahead at tomorrow...oooo you just really don't want to see that. But Kay, at least you can keep your woollies in their drawers for now!".

APPENDIX 4:

Questionnaire distributed during the weather survey described in Chapter 4.

DO NOT TURN OVER THIS PAGE

IT IS VERY IMPORTANT FOR THE RESULTS OF THIS SURVEY THAT YOU DO NOT TURN OVER THIS PAGE UNTIL YOU ARE ASKED TO DO SO.

THANK YOU

1. Was the weather presenter male or female?

Male ❑ Female ❑

2. How long would you estimate the weather forecast bulletin to have been?

Tick one

Less than 30 seconds ❑
30 seconds to 60 seconds ❑
1 minute to 1.5 minutes ❑
1.5 to 2 minutes ❑
Longer than 2 minutes ❑
Don't know ❑

3. What information was contained on the maps (not said by the presenter) within the weather forecast bulletin?

Tick those which apply

Cloud	❑	Rain	❑
Wind	❑	Sunshine	❑
Temperature	❑	Humidity	❑
Pressure	❑	Fronts	❑
Satellite	❑	Radar	❑
Frost	❑	Mist/fog	❑
UV Index	❑	Pollen count	❑
Tides	❑	Surf	❑

4. Was the weather going to feel:

Tick one

Warm ❑ Cool ❑ Chilly ❑ Very warm ❑ Don't know ❑

5. How far ahead did the weather forecast go?

Select the time frame shown

Tomorrow	❑	Tonight	❑	Today	❑
Saturday	❑	Sunday	❑	Weekend	❑
Week ahead	❑	Next month	❑	Don't know	❑

6. Where was low pressure situated by the weekend?

Tick one

South of England	❑	West of Ireland	❑
East of Kent	❑	West of Scotland	❑
North of Scotland	❑	East of Ireland	❑
Don't know	❑		

7. What was today's maximum temperature forecast to be?

Tick one

7C ❑ 13C ❑ 18C ❑ 19C ❑ 22C ❑
Don't know ❑

8. What was tonight's lowest temperature forecast to be?

Tick one

7C ❑ 10C ❑ 13C ❑ 15C ❑ 17C ❑
Don't know ❑

9. What was tomorrow's weather?

Tick one

Dry ❑ Wet ❑ Cold ❑ Warm ❑ Don't know ❑

10. Was the bulletin?
Tick those which apply
Too long ❑ Too short ❑ About right ❑

11. What do you think was most useful in conveying the weather forecast information?
Tick one
What the presenter said ❑
The information on the maps ❑
Both ❑

12. How many television weather bulletins do you watch each week?
Tick one
Less than once ❑ 1-3 ❑ 4-6 ❑ 7+❑
Don't know ❑

13. Why would you watch a TV weather forecast?
Tick any that apply
There's nothing else on ❑
Because you're interested ❑
For something specific ❑
At the weekend ❑

14. From what source are you <u>most likely</u> to get a weather forecast?
Tick any that apply

Web site	❑	Podcast	❑
View via web site	❑	Listen via web site	❑
Text message	❑	TV on mobile	❑
BBC,ITV,Ch4,Ch5	❑	Sky/Satellite TV	❑
Radio	❑	Newspaper	❑
Listen on telephone	❑	Fax	❑

15. How would you like to get weather forecasts in future?
Tick any that apply

Web site	❑	Podcast	❑
View via web site	❑	Listen via web site	❑
Text message	❑	TV on mobile	❑
BBC,ITV,Ch4,Ch5	❑	Sky/Satellite TV	❑
Radio	❑	Newspaper	❑
Listen on telephone	❑	Fax	❑

16. Where are you now? Please mark an "X" on the map below

IT IS VERY IMPORTANT FOR THE RESEARCH THAT YOU DO NOT COPY

Thank you for your time and patience in completing this survey.
The results will be made available online at
http://www.weatherweb.net/phdsurveys.htm

APPENDIX 5:

Weather Passive responses to survey in Chapter 5.

		TOTAL	%
1	**Was the weather presenter male or female?**		
	Male	147	96.1
	Female	6	3.9
2	**How long would you estimate the weather forecast bulletin to have been?**		
	<30 sec	2	1.3
	30 to 60 sec	48	31.4
	1 to 1.5 minutes	56	36.6
	1.5 to 2 minutes	42	27.5
	> 2 minutes	5	3.3
	Don't know	0	0
3	**What information was contained on the maps (not said by the presenter)?**		
	Cloud	66	43.1
	Wind	46	30.1
	Temperature	98	64.1
	Pressure	71	46.4
	Satellite	10	6.5
	Frost	0	0
	UV Index	1	0.7
	Rain	112	73.2
	Sunshine	38	24.8
	Humidity	2	1.3
	Fronts	91	59.5
	Radar	3	2
	Mist/fog	16	10.5
	Pollen count	0	0
	Surf	0	0
	Tides	2	1.3
4	**Was the weather going to feel?**		
	Warm	81	52.9
	Cool	55	35.9
	Chilly	12	7.8
	Very warm	0	0
	Don't know	6	3.9
5	**How far ahead did the weather forecast go?**		
	Tomorrow	18	11.8
	Tonight	1	0.7
	Today	0	0
	Saturday	3	2
	Sunday	47	30.7
	Weekend	76	49.7
	Week ahead	5	3.3
	Next month	0	0
	Don't know	3	2

6	**Where was low pressure situated by the weekend?**		
	South of England	37	24.2
	East of Kent	17	11.1
	North of Scotland	10	6.5
	Don't know	59	38.6
	West of Ireland	19	12.4
	West of Scotland	5	3.3
	East of Ireland	7	4.6
7	**What was today's maximum temperature forecast to be?**		
	7	0	0
	13	23	15
	18	49	32
	19	62	40.5
	22	0	0
	Don't know	19	12.4
8	**What was tonight/s lowest temperature forecast to be?**		
	7	25	16.3
	10	31	20.3
	13	27	17.6
	15	5	3.3
	17	2	1.3
	Don't know	63	41.2
9	**What was tomorrow's weather?**		
	Dry	1	0.7
	Wet	137	89.5
	Cold	2	1.3
	Warm	4	2.6
	Don't know	8	5.2
10	**Was the bulletin?**		
	Too long	10	6.5
	Too short	15	9.8
	About right	127	83
11	**What do you think was most useful in conveying the weather forecast information?**		
	Presenter	42	27.5
	Maps	32	20.9
	Both	79	51.6
12	**How many television weather bulletins do you watch each week?**		
	Less than one	40	26.1
	1 to 3	78	51
	4 to 6	23	15
	>7	4	2.6
	Don't know	7	4.6

13	**Why would you watch a TV weather forecast?**		
	There's nothing else on	28	18.3
	Because you're interested	66	43.1
	For something specific	85	55.6
	At the weekend	27	17.6
14	**From what source are you most likely to get a weather forecast?**		
	Web site	87	56.9
	View via web site	14	9.2
	Text message	2	1.3
	BBC,ITV,Ch4,Ch5	115	75.2
	Radio	46	30.1
	Listen on telephone	1	0.7
	Podcast	0	0
	Listen via web site	4	2.6
	TV on mobile	3	2
	Sky/satellite	19	12.4
	Newspaper	36	23.5
	Fax	0	0
15	**How would you like to get weather forecasts in the future?**		
	Web site	79	51.6
	View via web site	8	5.2
	Text message	22	14.4
	BBC,ITV,Ch4,Ch5	87	56.9
	Radio	35	22.9
	Listen on telephone	4	2.6
	Podcast	6	3.9
	Listen via web site	8	5.2
	TV on mobile	17	11.1
	Sky/satellite	16	10.5
	Newspaper	22	14.4
	Fax	0	0

APPENDIX 6:

Weather Aware responses to survey in Chapter 5

		TOTAL	%
1	**Was the weather presenter male or female?**		
	Male	236	99.6
	Female	1	0.4
	Don't know	0	0.0
	Total Respondents	237	100.0
	(skipped this question)	0	0.0
2	**How long do you estimate the weather forecast bulletin to have been? (select one)**		
	Less than 30 seconds	3	1.3
	30 seconds to 60 seconds	48	20.3
	1 minute to 1.5 minutes	113	47.7
	1.5 to 2 minutes	61	25.7
	Longer than 2 minutes	12	5.1
	Don't know	0	0.0
	Total Respondents	237	100.0
	(skipped this question)	0	0.0
3	**What information was displayed on the maps (not said by the presenter) within the weather forecast bulletin? (select any that apply)**		
	Cloud	146	61.6
	Wind	134	56.5
	Temperature	180	75.9
	Pressure	108	45.6
	Satellite	11	4.6
	Frost	2	0.8
	UV Index	1	0.4
	Tides	1	0.4
	Rain	185	78.1
	Sunshine	84	35.4
	Humidity	2	0.8
	Fronts	179	75.5
	Radar	5	2.1
	Mist/Fog	17	7.2
	Pollen	1	0.4
	Surf	1	0.4
	Total Respondents	234	98.7
	(skipped this question)	3	1.3
4	**Was the weather going to feel? (select one)**		
	Warm	166	70.0
	Cool	41	17.3
	Chilly	17	7.2
	Very warm	1	0.4
	Don't know	12	5.1

	Total Respondents	237	100.0
	(skipped this question)	0	0.0

5 How far ahead did the weather forecast go? (select one)

Tomorrow	41	17.3
Tonight	5	2.1
Today	5	2.1
Saturday	14	5.9
Sunday	86	36.3
Weekend	111	46.8
Week ahead	3	1.3
Next month	0	0.0
Don't know	2	0.8
Total Respondents	237	100.0
(skipped this question)	0	0.0

6 Where was the low pressure situated by the weekend? (select one)

South of England	23	9.7
East of Kent	19	8.0
North of Scotland	26	11.0
West of Ireland	68	28.7
West of Scotland	28	11.8
East of Ireland	25	10.5
Don't know	48	20.3
Total Respondents	237	100.0
(skipped this question)	0	0.0

7 What was today's maximum temperature forecast to be? (select one)

7C	2	0.8
13C	22	9.3
18C	51	21.5
19C	126	53.2
22C	0	0.0
Don't know	35	14.8
Total Respondents	236	99.6
(skipped this question)	1	0.4

8 What was tonight's lowest temperature forecast to be? (select one)

7C	24	10.1
10C	21	8.9
13C	54	22.8
15C	9	3.8
17C	0	0.0
Don't know	128	54.0
Total Respondents	236	99.6
(skipped this question)	1	0.4

9	**What was tomorrow's weather? (select one)**		
	Dry	13	5.5
	Wet	211	89.0
	Cold	0	0.0
	Warm	8	3.4
	Don't know	5	2.1
	Total Respondents	237	100.0
	(skipped this question)	0	0.0
10	**Was the bulletin? (select one)**		0.0
	Too long	13	5.5
	Too short	101	42.6
	About right	122	51.5
	Total Respondents	236	99.6
	(skipped this question)	1	0.4
11	**What do you think was most useful in conveying the weather forecast information? (select one)**		
	What the presenter said	10	4.2
	The information on the maps	100	42.2
	Both	127	53.6
	Total Respondents	237	100.0
	(skipped this question)	0	0.0
12	**How many television weather bulletins do you watch each week? (select one)**		
	Less than one	15	6.3
	1 to 3	42	17.7
	4 to 6	82	34.6
	7+	97	40.9
	Don't know	1	0.4
	Total Respondents	237	100.0
	(skipped this question)	0	0.0
13	**Why would you watch a TV weather forecast? (select any that apply)**		
	There's nothing else on	7	3.0
	Because you're interested in weather	122	51.5
	For something specific	92	38.8
	At the weekend	15	6.3
	Total Respondents	236	99.6
	(skipped this question)	1	0.4
14	**From what source are you most likely to get a weather forecast? (select any that apply)**		
	Web site	227	95.8
	View TV via web site	12	5.1
	Text message	11	4.6

BBC, ITV, Ch4, Ch5	182	76.8
Radio	117	49.4
Listen on telephone	9	3.8
Podcast	0	0.0
Listen via web site	2	0.8
TV on mobile telephone	1	0.4
Sky/Satellite TV	31	13.1
Newspaper	43	18.1
Fax	3	1.3
Total Respondents	237	100.0
(skipped this question)	0	0.0

15 How would you like to get weather forecasts in future? (select any that apply)

Web site	230	97.0
View TV via web site	35	14.8
Text message	41	17.3
BBC, ITV, Ch4, Ch5	183	77.2
Radio	118	49.8
Listen on telephone	15	6.3
Podcast	14	5.9
Listen via web site	23	9.7
TV on mobile telephone	16	6.8
Sky/Satellite TV	35	14.8
Newspaper	34	14.3
Fax	4	1.7
Total Respondents	236	99.6
(skipped this question)	1	0.4

APPENDIX 7:

Weather Passive responses to survey in Chapter 6

1	**A front on a weather chart is shown as red semi-circles. What type of front is this?**		
	Trough	0	0
	Warm front	134	95
	Occluded front	3	2.1
	Cold front	4	2.8
	Total Respondents	141	
	(skipped this question)	0	0
2	**A front on a weather chart is shown as purple triangles and semi-circles. What type of front is this?**		
	Warm front	3	2.2
	Cold front	17	12.3
	Trough	39	28.3
	Occluded front	78	56.5
	Total Respondents	137	
	(skipped this question)	1	0.7
3	**A front on a weather chart is shown as a solid black line or as a dashed black line. What type of front is this?**		
	Warm front	0	0
	Cold front	15	11.1
	Trough	84	62.2
	Occluded front	33	24.4
	Total Respondents	132	
	(skipped this question)	3	2.2
4	**A front on a weather chart is shown as blue triangles. What type of front is this?**		
	Cold Front	123	87.2
	Warm Front	3	2.1
	Occluded Front	8	5.7
	Trough	7	5
	Total Respondents	141	
	(skipped this question)	0	0
5	**If you were to see the following forecast chart how would you summarise the forecast?**		
	Cloudy, heavy rain in south	46	34.6
	Showery and cloudy	19	14.3
	Rain in south, showers in north	15	11.3
	Brighter later, showery	7	5.3
	Bright spells and showery	23	17.3
	Cloudy and wet	23	17.3

	Total Respondents	133	

6	**If you saw the following forecast chart how would you summarise the weather?**		
	Cloudy, heavy rain in south	22	16.3
	Showery and cloudy	17	12.6
	Rain in south, showers in north	30	22.2
	Brighter later, showery	3	2.2
	Bright spells and showery	48	35.6
	Cloudy and wet	15	11.1
	Total Respondents	136	

7	**If you saw the following forecast chart how would you summarise the weather?**		
	Sunny spells and showers	49	34.8
	Showers for the west, sunny in east	20	14.2
	Mainly dry, an odd shower	44	31.2
	Cloudy and wet	8	5.7
	Rather cloudy, light rain	20	14.2
	Total Respondents	141	

8	**If you saw the following forecast chart how would you summarise the weather?**		
	Sunny spells and showers	49	37.7
	Showers for the west, sunny in east	35	26.9
	Mainly dry, an odd shower	36	27.7
	Cloudy and wet	2	1.5
	Rather cloudy, light rain	8	6.2
	Total Respondents	130	

9	**If you saw the following forecast chart how would you summarise the weather?**		
	Bright spells & showers in south, fair north & west	29	22.1
	Sunshine and showers for all	10	7.6
	Wet, but with a few bright spells	11	8.4
	Windy and cloudy, only brief bright spells, showers	17	13
	Cloudy and showery, but brighter in the north & west	64	48.9
	Total Respondents	131	

10	**If you saw the following forecast chart how would you summarise the weather?**		
	Bright spells & showers in south, fair north & west	33	25
	Sunshine and showers for all	26	19.7
	Wet, but with a few bright spells	18	13.6
	Windy and cloudy, only brief bright spells, showers	4	3
	Cloudy and showery, but brighter in the north & west	51	38.6

	Total Respondents	132	

11 If you saw the following forecast chart how would you summarise the weather?

Cloud and wet, rain in south	29	22.1
Wet south, scattered showers elsewhere	26	19.8
Sunny spells and showers	8	6.1
Wet and cloudy	19	14.5
Rain in south, broken cloud & showers in north	49	37.4
Total Respondents	131	

12 If you saw the following forecast chart how would you summarise the weather?

Cloud and wet, rain in south	6	4.6
Wet south, scattered showers elsewhere	2	1.5
Sunny spells, showers in the south	95	73.1
Wet and cloudy	7	5.4
Rain in south, broken cloud & showers in north	20	15.4
Total Respondents	130	

13 What graphical representation do you find most useful?

Contours (i.e. BBC)	46	35.1
Symbols	85	64.9
Total Respondents	131	

14

	Response Total	
Sunny spells	19	15.1
Light rain	0	0
Sunshine & showers	0	0
Heavy rain	1	0.8
Thunderstorms	0	0
Sunshine	106	84.1
Drizzle	0	0
Mist or Fog	0	0
Total Respondents	126	

15

Sunny spells	0	0

	Light rain	71	56.3
	Sunshine & showers	12	9.5
	Heavy rain	8	6.3
	Thunderstorms	3	2.4
	Sunshine	0	0
	Drizzle	27	21.4
	Mist or Fog	5	4
	Total Respondents	126	

16 

	Sunny spells	0	0
	Light rain	7	5.6
	Sunshine & showers	0	0
	Heavy rain	114	90.5
	Thunderstorms	2	1.6
	Sunshine	0	0
	Drizzle	3	2.4
	Mist or Fog	0	0
	Total Respondents	126	

17 

	Sunny spells	72	57.1
	Light rain	1	0.8
	Cloudy	51	40.5
	Sunshine & showers	2	1.6
	Heavy rain	0	0
	Thunderstorms	0	0
	Sunshine	0	0
	Drizzle	0	0
	Mist or Fog	0	0
	Total Respondents	126	

18 

	Sunny spells	0	0
	Light rain	100	79.4
	Cloudy	1	0.8
	Sunshine & showers	0	0
	Heavy rain	3	2.4
	Thunderstorms	0	0
	Sunshine	0	0

	Drizzle	22	17.5
	Mist or Fog	0	0
	Total Respondents	126	

19

Sunny spells	0	0
Light rain	1	0.8
Cloudy	3	2.4
Sunshine & showers	2	1.6
Heavy rain	3	2.4
Thunderstorms	116	92.8
Sunshine	0	0
Drizzle	0	0
Mist or Fog	0	0
Total Respondents	125	

20

Sunny spells	0	0
Light rain	3	2.4
Cloudy	2	1.6
Sunshine & showers	0	0
Heavy rain	119	94.4
Thunderstorms	1	0.8
Sunshine	0	0
Drizzle	1	0.8
Mist or Fog	0	0
Total Respondents	126	

21

Sunny spells	37	29.4
Light rain	0	0
Cloudy	1	0.8
Sunshine & showers	0	0
Heavy rain	1	0.8
Thunderstorms	0	0
Sunshine	84	66.7
Drizzle	1	0.8
Mist or Fog	2	1.6
Total Respondents	126	

22 

Sunny spells	1	0.8
Light rain	0	0
Sunshine & showers	82	65.1
Heavy rain	0	0
Cloudy	0	0
Thunderstorms	1	0.8
Sunshine	0	0
Drizzle	0	0
Mist or Fog	42	33.3
Total Respondents	126	

23 

Sunny spells	1	0.8
Light rain	0	0
Cloudy	0	0
Sunshine & showers	25	19.8
Heavy rain	0	0
Thunderstorms	99	78.6
Sunshine	1	0.8
Drizzle	0	0
Mist or Fog	0	0
Total Respondents	126	

24 Please enter your suggestions below

Total Respondents	55
(skipped this question)	37

APPENDIX 8:

Weather Aware responses to survey in Chapter 6

1	**A front on a weather chart is shown as red semi-circles. What type of front is this?**		
	Trough	0	0.0
	Warm front	276	97.9
	Occluded front	1	0.4
	Cold front	5	1.8
	Total Respondents	282	100.0
	(skipped this question)	0	0.0
2	**A front on a weather chart is shown as purple triangles and semi-circles. What type of front is this?**		
	Warm front	0	0.0
	Cold front	3	1.1
	Trough	8	2.8
	Occluded front	269	95.4
			0.0
	Total Respondents	280	99.3
	(skipped this question)	2	0.7
3	**A front on a weather chart is shown as a solid black line or as a dashed black line. What type of front is this?**		
	Warm front	2	0.7
	Cold front	12	4.3
	Trough	252	89.4
	Occluded front	9	3.2
			0.0
	Total Respondents	275	97.5
	(skipped this question)	7	2.5
4	**A front on a weather chart is shown as blue triangles. What type of front is this?**		
	Cold Front	272	96.5
	Warm Front	4	1.4
	Occluded Front	3	1.1
	Trough	3	1.1
	Total Respondents	282	100.0
	(skipped this question)	0	0.0
5	**If you were to see the following forecast chart how would you summarise the forecast?**		
	Cloudy, heavy rain in south	93	33.0
	Showery and cloudy	40	14.2
	Rain in south, showers in north	40	14.2
	Brighter later, showery	8	2.8
	Bright spells and showery	63	22.3
	Cloudy and wet	23	8.2
	Total Respondents	262	92.9
	(skipped this question)	20	7.1

6	**If you saw the following forecast chart how would you summarise the weather?**		
	Cloudy, heavy rain in south	33	11.7
	Showery and cloudy	20	7.1
	Rain in south, showers in north	128	45.4
	Brighter later, showery	2	0.7
	Bright spells and showery	57	20.2
	Cloudy and wet	29	10.3
	Total Respondents	262	92.9
	(skipped this question)	20	7.1
7	**If you saw the following forecast chart how would you summarise the weather?**		
	Sunny spells and showers	137	48.6
	Showers for the west, sunny in east	26	9.2
	Mainly dry, an odd shower	67	23.8
	Cloudy and wet	12	4.3
	Rather cloudy, light rain	20	7.1
	Total Respondents	262	92.9
	(skipped this question)	20	7.1
8	**If you saw the following forecast chart how would you summarise the weather?**		
	Sunny spells and showers	89	31.6
	Showers for the west, sunny in east	87	30.9
	Mainly dry, an odd shower	82	29.1
	Cloudy and wet	0	0.0
	Rather cloudy, light rain	4	1.4
	Total Respondents	262	92.9
	(skipped this question)	20	7.1
9	**If you saw the following forecast chart how would you summarise the weather?**		
	Bright spells & showers in south, fair north & west	67	23.8
	Sunshine and showers for all	23	8.2
	Wet, but with a few bright spells	6	2.1
	Windy and cloudy, only brief bright spells, showers	4	1.4
	Cloudy and showery, but brighter in the north & west	162	57.4
	Total Respondents	262	92.9
	(skipped this question)	20	7.1
10	**If you saw the following forecast chart how would you summarise the weather?**		
	Bright spells & showers in south, fair north & west	51	18.1
	Sunshine and showers for all	23	8.2
	Wet, but with a few bright spells	15	5.3
	Windy and cloudy, only brief bright spells, showers	4	1.4
	Cloudy and showery, but brighter in the north & west	169	59.9
	Total Respondents	262	92.9
	(skipped this question)	20	7.1

11	**If you saw the following forecast chart how would you summarise the weather?**		
	Cloud and wet, rain in south	39	13.8
	Wet south, scattered showers elsewhere	51	18.1
	Sunny spells and showers	6	2.1
	Wet and cloudy	47	16.7
	Rain in south, broken cloud & showers in north	119	42.2
	Total Respondents	262	92.9
	(skipped this question)	20	7.1

12	**If you saw the following forecast chart how would you summarise the weather?**		
	Cloud and wet, rain in south	12	4.3
	Wet south, scattered showers elsewhere	7	2.5
	Sunny spells, showers in the south	206	73.0
	Wet and cloudy	14	5.0
	Rain in south, broken cloud & showers in north	23	8.2
	Total Respondents	262	92.9
	(skipped this question)	20	7.1

13	**What graphical representation do you find most useful?**		
	Contours (i.e. BBC)	120	42.6
	Symbols	142	50.4
	Total Respondents	262	92.9
	(skipped this question)	20	7.1

14

	Response Total	
Sunny spells	33	11.7
Light rain	2	0.7
Sunshine & showers	1	0.4
Heavy rain	0	0.0
Thunderstorms	0	0.0
Sunshine	225	79.8
Drizzle	0	0.0
Mist or Fog	0	0.0
Total Respondents	261	92.6
(skipped this question)	21	7.4

15

Sunny spells	0	0.0
Light rain	159	56.4
Sunshine & showers	56	19.9

	Heavy rain	25	8.9
	Thunderstorms	6	2.1
	Sunshine	0	0.0
	Drizzle	15	5.3
	Mist or Fog	0	0.0
	Total Respondents	261	92.6
	(skipped this question)	21	7.4

16 

			0.0
	Sunny spells	1	0.4
	Light rain	6	2.1
	Sunshine & showers	2	0.7
	Heavy rain	249	88.3
	Thunderstorms	0	0.0
	Sunshine	0	0.0
	Drizzle	3	1.1
	Mist or Fog	0	0.0
	Total Respondents	261	92.6
	(skipped this question)	21	7.4

17 

	Sunny spells	174	61.7
	Light rain	1	0.4
	Cloudy	63	22.3
	Sunshine & showers	19	6.7
	Heavy rain	1	0.4
	Thunderstorms	1	0.4
	Sunshine	2	0.7
	Drizzle	0	0.0
	Mist or Fog	0	0.0
	Total Respondents	261	92.6
	(skipped this question)	21	7.4

18 

	Sunny spells	0	0.0
	Light rain	226	80.1
	Cloudy	13	4.6
	Sunshine & showers	1	0.4
	Heavy rain	4	1.4
	Thunderstorms	3	1.1
	Sunshine	0	0.0
	Drizzle	14	5.0
	Mist or Fog	0	0.0

	Total Respondents	261	92.6
	(skipped this question)	21	7.4
			0.0

19

Sunny spells	0	0.0
Light rain	4	1.4
Cloudy	1	0.4
Sunshine & showers	10	3.5
Heavy rain	7	2.5
Thunderstorms	238	84.4
Sunshine	0	0.0
Drizzle	1	0.4
Mist or Fog	0	0.0
Total Respondents	261	92.6
(skipped this question)	21	7.4

20

Sunny spells	1	0.4
Light rain	3	1.1
Cloudy	2	0.7
Sunshine & showers	1	0.4
Heavy rain	250	88.7
Thunderstorms	2	0.7
Sunshine	1	0.4
Drizzle	1	0.4
Mist or Fog	0	0.0
Total Respondents	261	92.6
(skipped this question)	21	7.4

21

Sunny spells	37	13.1
Light rain	2	0.7
Cloudy	1	0.4
Sunshine & showers	0	0.0
Heavy rain	0	0.0
Thunderstorms	0	0.0
Sunshine	210	74.5
Drizzle	1	0.4
Mist or Fog	10	3.5
Total Respondents	261	92.6
(skipped this question)	21	7.4

22 

Sunny spells	8	2.8
Light rain	0	0.0
Sunshine & showers	2	0.7
Heavy rain	0	0.0
Cloudy	143	50.7
Thunderstorms	2	0.7
Sunshine	2	0.7
Drizzle	1	0.4
Mist or Fog	103	36.5
Total Respondents	261	92.6
(skipped this question)	21	7.4

23 

Sunny spells	4	1.4
Light rain	0	0.0
Cloudy	0	0.0
Sunshine & showers	40	14.2
Heavy rain	0	0.0
Thunderstorms	216	76.6
Sunshine	1	0.4
Drizzle	0	0.0
Mist or Fog	0	0.0
		0.0
Total Respondents	261	92.6
(skipped this question)	21	7.4

24 Please enter your suggestions below

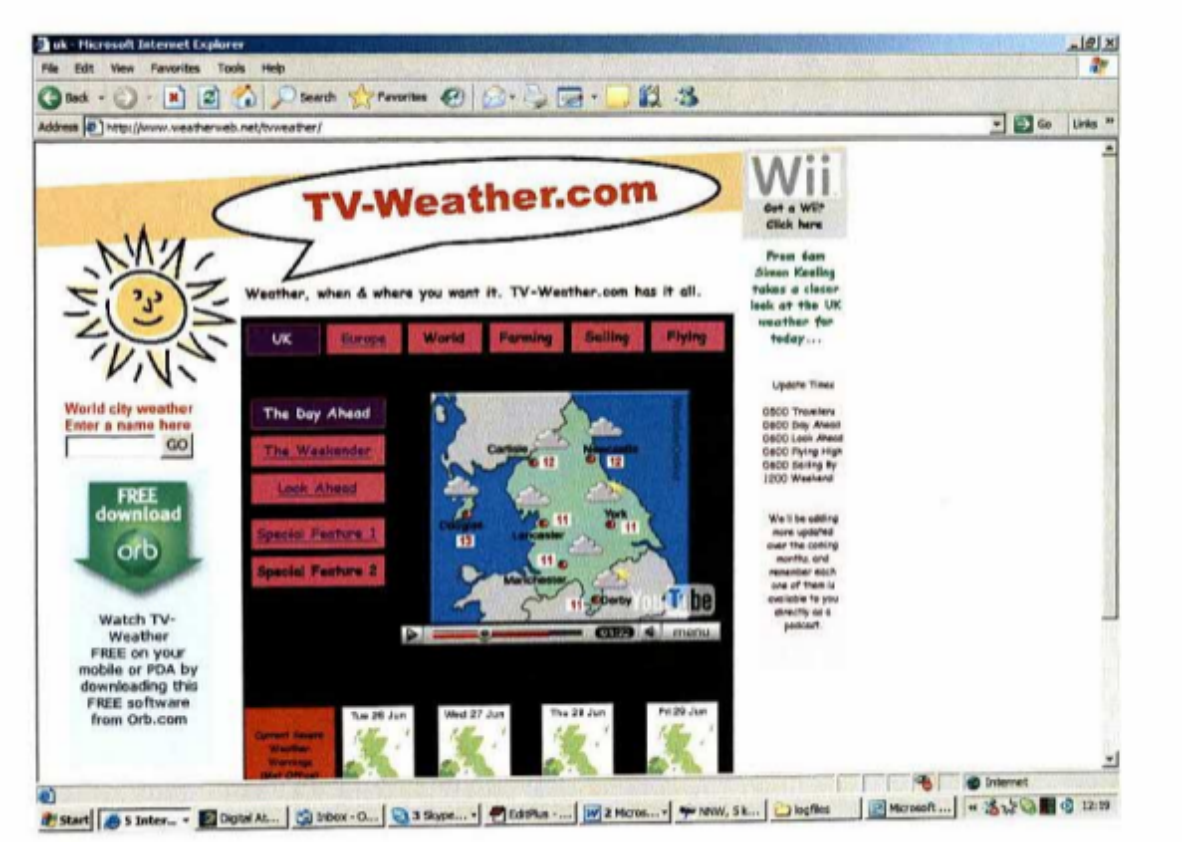
Total Respondents	237	84.0
(skipped this question)	45	16.0

25 Please enter your name address telephone number and email address

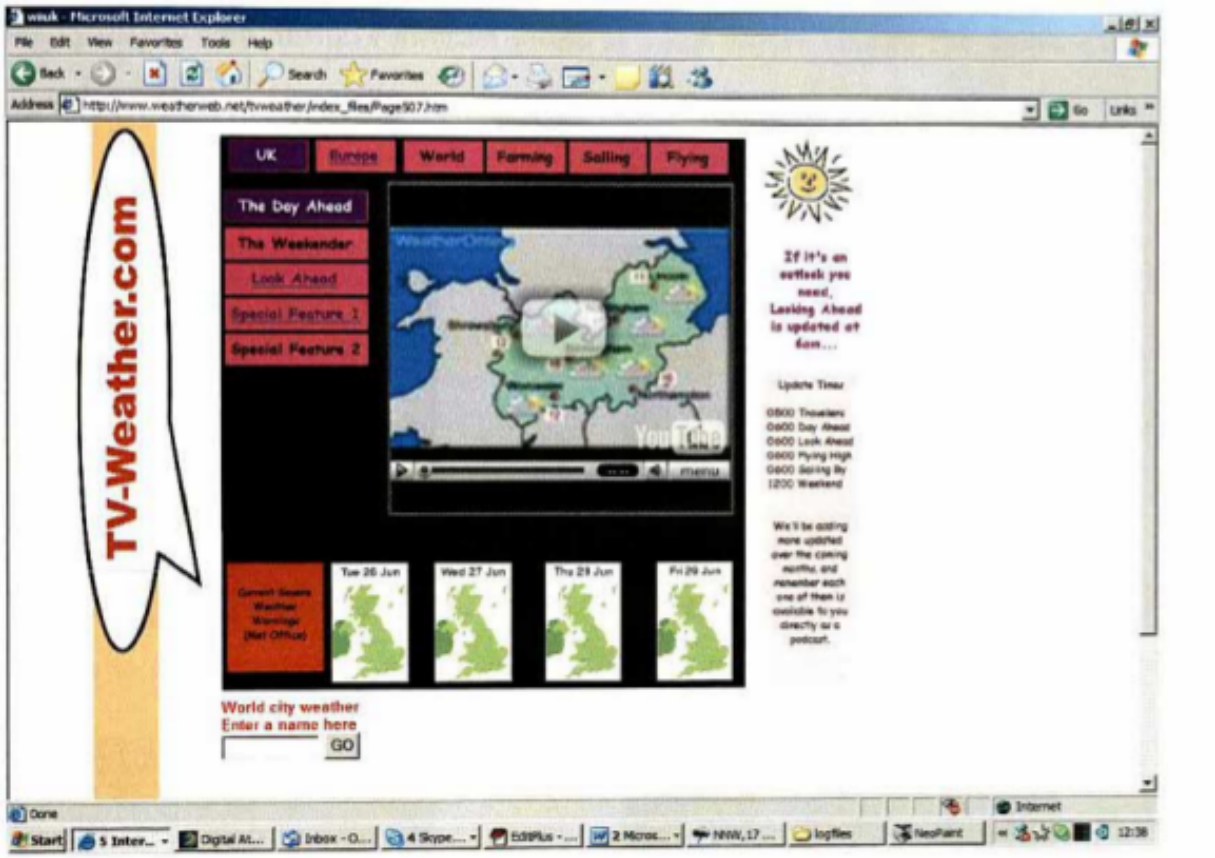
Total Respondents	189	67.0
(skipped this question)	93	33.0

APPENDIX 9:

An example of an internet weather channel (TV-Weather.com). The homepage shows the Day Ahead forecast. A 'What's Coming Up' preview box is to the right of the screen, with an option for a viewer to enter a postcode and get a forecast to the left of the screen. Orb software enables viewers to watch TV-Weather on mobile and PDA without paying network charges to mobile telephone companies, the data is streamed from the users 'computer.



A Wii homepage, designed specifically for the Wii console to enable viewers to watch forecasts via standard television.



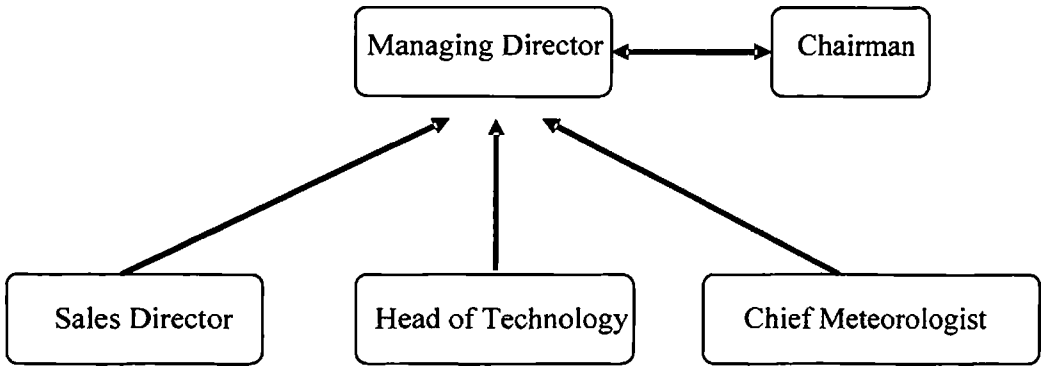
Typical storyboard of a weather forecast on the proposed internet weather channel. The forecast is introduced with a logo, followed by an advert. The meteorologist then introduces the forecast which displays forecast charts as a full screen image. The forecast then comes back into vision to end the forecast and the station located is displayed again.

APPENDIX 10:

Requirements, Structure and Finances of an Internet Weather Channel

The Channel would require minimal staffing and, as such could be established at a relatively low cost. A Chairman with experience of establishing such channels and of the television market would be appointed to provide advice to management.

Organisational Structure of an Internet Weather Channel



As can be seen from the flow chart above, the structure of the Channel is straight forward. Responsibilities are clearly defined with meteorological, sales and technology each reporting directly to the Managing Director. Each of the roles are detailed below.

Chairman - Providing a 'face' for the company and offering experience and guidance on broadcast and all areas of business.

Managing Director (P/T or F/T) - Operating the Company on a day-to-day basis and ensuring that the Company operates smoothly. Responsible for staff, and ensuring that they are fully aware of the objectives of the company.

Sales Director - Seeking and selling sponsorship and advertising, the Sales Director is responsible to the Managing Director. This role could initially be offered on a freelance basis, with a basic contract fee supplemented by a sales commission.

Technical Director - Developing and supporting the company I.T. systems, and providing cover when systems fail. Responsible to Managing Director this role could be fulfilled by a part-time or freelance person.

Chief Meteorologist - Managing meteorological presenters and ensuring the on-air quality of content and forecasts, the Chief Meteorologist role includes creating rosters for meteorological presenters and advising on the feasibility of new programming, as well as being an operational forecaster.

Technological Requirements

Only a few years ago the cost of the technology needed to provide the internet weather channel as proposed would have been almost prohibitively expensive. As the price of computer technology has fallen, the feasibility of such a project has increased. Affordable computer equipment would now make the Channel financially viable within a shorter time-frame.

The main cost of broadcasting a channel via the internet will be bandwidth. This problem can initially be overcome by using YouTube to provide the broadcasts. However, within a short time it is expected that it would be necessary to acquire a dedicated communications broadband line. This would enable multiple downloading and uploading of recorded files.

Ongoing improvements in technology should be embraced by the Channel. As new developments take place they should be developed for use by the Channel. As with other

technologies, many of them will fail to become used widely, however a few may become the standard platform for broadcasting through the coming years.

Computer Requirements

Existing off-the-shelf computers provide adequate performance for broadcast via the internet and digital television. Video software, such as Windows Movie Maker, is available to create and edit weather forecasts. Movie Maker can be time consuming and therefore more sophisticated editing software would probably need to be purchased to enable the process to be speeded up.

A high quality camera should be used in order to record in broadcast quality images, although to commence broadcasting, a lower quality camera may be used. However, by using a high quality camera the Channel can be offered to digital broadcasters for transmission on existing television channels.

To facilitate the broadcast of videos, an agreement would initially be sought with YouTube.com. YouTube already offer such facilities to established broadcasters. However, this method of transmission is not perfect and so it would be advisable for the Channel to purchase it's own servers and bandwidth once this proposition could be financially sustained.

Graphic Requirements

Several weather companies provide television graphical interfaces (Weatherone, Metra, Weather News etc.). These are bespoke to each company. To avoid potential conflicts of interest it would be advisable for the Channel to have it's own graphical interface. Weatheronline.co.uk have advised that they would be willing to supply graphics and satellite pictures to the Channel in exchange for their logo being shown on each graphic.

Marketing the Channel

The Channel should aim to become a brand name associated with weather broadcasting as soon as possible. Brand awareness can be built by being the first weather channel in the UK and Europe to broadcast in English via the internet. By targeting interested groups, such as revealed in the surveys, it could quickly become established as providing forecasts that viewers want to use.

By being easily accessible from several platforms (home P.C., mobile telephones, games consoles etc.) the Channel can quickly become established as the method people use to retrieve weather information. By showing friends how they are receiving weather information, viral marketing could enable new viewers to watch forecast quickly.

Press releases to national newspapers, preview access to the service for selected users could also all be used. When severe weather is anticipated the Channel should ensure that press releases are issued in advance of those put out by the U.K. Meteorological Office or other weather forecasting organisations. However, as noted in section 8.9 actually short-term severe weather warnings broadcast on the Channel would be those issued by the U.K. Meteorological Office.

There is also considerable media interest in seasonal forecasting. Whilst care would need to be exercised in the wording of such forecasts issued to the media, useful publicity could be quickly attracted to the Channel.

Climate change is an issue which is achieving daily prominence in the media. By offering an opinion on climate change stories, perhaps assisting in research where applicable, the Channel could promote itself as being aware of climate change concerns and by being responsible in the language used to reflect the climate change story, scientific credibility could be enhanced.

Financial Aspects of the Channel

The Channel would make money by offering advertising both on the site, and sponsorship opportunities on each weather forecast. By using the information supplied gleaned from our surveys forecasts can be targeted to specific users. Therefore advertisers will be satisfied that the demographics of the forecast users will appeal to their potential customers.

High value advertising can be offered to those companies for whom high-surplus income users will be attracted to the Channel For example, sailing forecasts would be offered, appealing to high-value end users, and the cost of sponsorship of these forecasts would reflect the known demographics of such viewers. Business users would be targeted by forecasts specific to short period travelling in Europe, this again appealing to high income viewers and therefore to advertisers willing to spend significant sums of money on reaching such users.

Viewers can be increased by offering the forecasts for free for broadcast on various websites and therefore raising awareness of the Channel. For such users advertising may be amended, i.e. it would be imprudent for Easyjet to advertise on British Airways website.

Discussion of Financial Projections

Figure Ap10.1 shows the predicted monthly profit and loss account for an internet weather channel broadcasting only on the internet. These numerical statements have various assumptions made within them.

1. Four meteorologist/broadcasters are employed at £1000 per month. These posts are occupied by students who benefit from the experience of broadcasting.
2. A Technical Director is paid £500 per month, with additional payment in the form of shares in the company or other benefits,

3. A Chairman and Managing Director are retained on a salary of £1000 per month, with additional payment in the form of shares or other benefits.
4. Sales & Marketing Director is employed on a basic salary of £1500 per month plus 20% of total sales made during the month
5. In year 2 one of the meteorologists is appointed Senior meteorologist with a full time salary of £2400 per month.
6. Year 2 Technical Director remuneration will increase to £800 per month.
7. By Year 3 meteorologists will be full time at £2000 per month. A full time Web master is then employed at £2000 per month, with the M.D. and Chairman earning £1500 per month.

The charts reveal that monthly net profits remain at a loss throughout the first year of trading. It is not until the early part of year 2 that the company breaks even. From then monthly profits continue to rise, although expenses increase too.

A web server has been factored in, the cost of operating this reaching £1000 per month by year 3. A rent of £3000 per year, rising to £3360 per year in year 3 has been assumed. It should also be noted that power, bank charges, accountancy fees, marketing costs and a £2500 per year payment for meteorological briefings have been included.

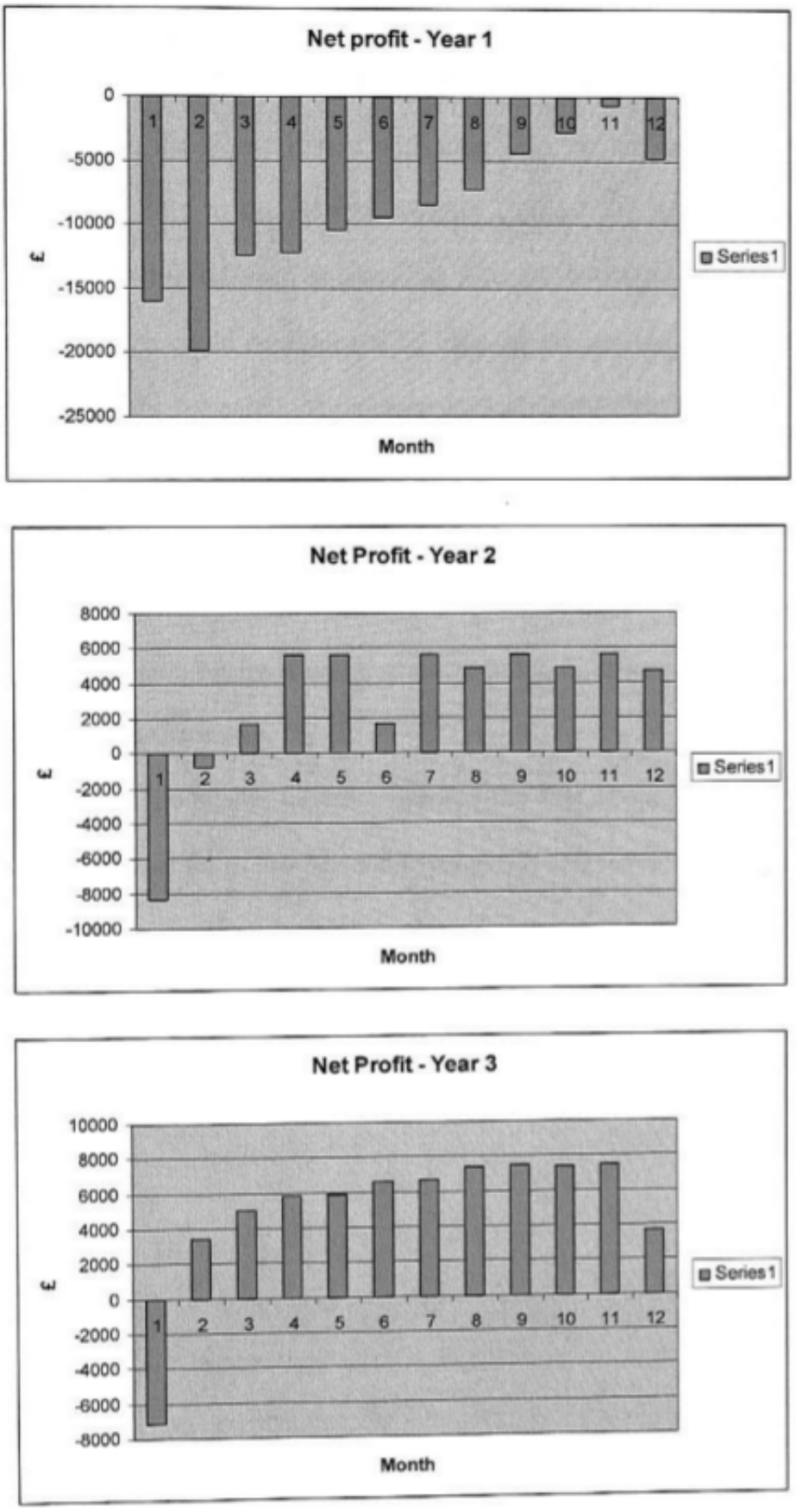


Figure Ap10.1 Net profit projections for an internet television channel

Predicted sales data have been created using a fee of £500 per month, per advertiser.

In the first month it is assumed that publicity will be gained by the Channel as customers

become familiar with the forecasts and begin to notify others of its existence. The first paying advertiser is in month 2, with 36 advertisers by the end of the year. Advertising costs would increase through the 3-year period with total sales by the end of year 3 at almost £400,000. This relates only to the internet weather channel and does not include sundry income which may be achieved, such as providing forecasts to third-parties.

Additional profits could be achieved by capping the amount paid to the Marketing Director, and reducing the fee paid to the meteorological service provider.

Exit Strategy

The Directors of the Channel would need to decide on an exit strategy. Options include continuing with the business on an ongoing basis, or selling the Channel should an offer from a buyer be forthcoming.

It is likely that should the Channel become the first to the market a buyer would approach the Channel in order to provide additional funds and develop it further. This would be a more cost effective option to a large organisation than creating a completely new weather channel.