Television's evolution from 1900 to nowadays
a mirror of digital progress and of our society

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Abstract. Throughout this document, we will develop the concept of television’s evolution in France since the beginning of the previous century. First of all, we will discover most important events in television history which left its mark on its progress. Then, we will discuss the different technologies employed by television according to discoveries which is related to. Finally, we will study the evolution of television in a social way, in other word the impact on our society, which utility and the limits nowadays.

Keywords
Television, television set, history, analogue transmission, digital progress, social power.

1. Introduction and evolution of television over time

Television is a group of technology designed to transmit and receive audiovisual sequences, called television program. The word comes from “tèle”, a greek word which means far, and from “visio”, a latin word which means sight. It is a mass media that allows the diffusion of information and the entertainment of users.

Its invention is the product of long and collective works predominantly about electricity and electronic between many scientists and engineers from everywhere. The first concepts date back to 1870-1880 : in 1880 the first idea of transmission of an image by projection on a photosensible surface composed of selenium was borned. In 1884, the german engineer, Paul Nipkov, invented a mechanical rotating device to analyze images line by line : it’s called Nipkov disk. In 1926, using the previous technology, John Logie Baird realised, in London, the first public retransmission of television in live : it was the first mechanical television without cathode ray tube.

The invention of the cathode ray tube by Karl Ferdinand Braun took place in 1897. It allowed the invention of the mechanical-electronic television that we all know.

In France, the emission of image is defined by 180 lines and the first short wave analogue emitter is installed on the top of the Eiffel Tower in 1935. In 1943, the first emission of Fernsehsender Paris, imposed by the German Authority installed in France, is received by a thousand of 441 lines receivers (mainly location for soldier). With end of war in 1945, french television emissions take place back with a definition varying from 441 to 450 lines. Then, french network definition is fixed to 819 lines by François Mitterand for the following year. The analogue network takes time to expand, but in 1956, 150000 household had a TV post and, in 1960/1961, we celebrated the completion of french national television network. In
1964, the second chain in black-and-white in 625 lines UHF was inaugurated: it helps exchange with others Europeans countries along because they almost all used this definition. In 1967, the second chain was coloured using SECAM IIIB process. Then, from 1984 to nowadays, several new private chains are created in VHF with the end of three main channel’s monopole.

The creation of DTT (Digital Terrestrial Television) occurred in 2005 with also the creation of 8 new channels in France. In 2008, this is the launch of DTT in high definition (HD). Finally, the definitive stop of analogue television is imposed for 2011 in France and in 2012 in European Union.

2. The evolution mechanism of TV broadcasting network

2.1. Analogue process

British physicist and chemist William Crookes discovered, during the great 19th century research on the conduction of electricity in low-pressure gases, that when the pressure was lowered the cathode emitted light rays. Like this, they were called cathode ray. Cathode rays are high-speed electron fluxes from a device called an electron gun. It consists of an indirectly heated cathode and a series of electrodes charged with accelerating and focusing the cathode ray beam. Heating the cathode generates electron emissions. The flux created in this way is then accelerated by an anode due to its very high potential (about 600 V) and focused in order to obtain a fine beam. This electron beam then strikes a sensitive photo screen on which an electroluminescent layer is deposited. By reacting to the shock of electrons, a light point called "spot" is created. The latter comes to illuminate the screen at the rhythm of the scan conducted by the deflection. It is therefore this deflection mechanism that carries out the horizontal and vertical scanning (lines and frames). In the case of televisions, the image is created by varying the intensity of the electron flux (the beam), and thus the luminous intensity of the spot, along its path.

In 1876, Wordsworth Denisthorpe filed a patent for the design of one of the first cameras. Then, in 1888, Louis Le Prince also designed his first camera. Much work followed around the world to improve this innovation. It is used to capture or record an image and sound that forms a raw signal in order to retransmit it to cinema or television, for example. This signal is then processed by an analyzer, and an amplifier that makes some corrections. In addition, suppressions and synchronization signals are added to the initial signal to facilitate its transmission. Analogue terrestrial television received by the general public is broadcast by a complex network of transmitters that receive waves ranging from 470 to 860 MHz.

Actually, each television channel has its own frequency. It transmits its signal, which is picked up by a control tower. Once corrected, the signal is sent back to a transmitter or relay transmitter, which then transmits the signal to the receiving antennas, which then demodulate the electrical signal and direct it to the CRT of the television post. The user can then transcribe his or her video image and the user is ready to enjoy it.

Until 1960s and 1970s, in France, television was in black-and-white. SÉCAM was invented by Henri de France and marketed from 1967 onwards. It designates a standardised analogue colour video coding mode used in France. Some other way, with colour the main transmission process is exactly the same as explained previously, there are only a few differences in signal composition and in the way the cathode ray tube allows image retransmission. In deed, there is three electron guns, Red-Green-Blue, who project their beams on the bottom of the tube. The selectivity of their action is ensured by a perforated mask with each hole in the beams, a calibrated electron cylinder. The three so-called primary lights make the additive synthesis at the reception at the screen level. By respecting certain mixing laws, the expected image is obtained in colour.

2.2. Reasons of transition

In France, until 29 November 2011, there are two modes of terrestrial television reception: analogue television and digital terrestrial television (DTT). Since its launch in March 2005, DTT has been a huge success, due to its wide range of services: 19 free channels, 9 pay-TV channels and one or more local
channels, all with image and sound quality far superior to that of analogue terrestrial broadcasting. A major reason for the transition is that analogue broadcasting consumes about six times more frequencies than digital broadcasting. Thus, the stopping of the broadcasting of the six analogue channels makes available a relatively large volume of frequencies with recognised qualities in terms of propagation and penetration into buildings. In addition, the launch of new services on these available frequencies is the main objective of the analogue switch-off. Some of the frequencies freed up are used, in particular, to provide access to very high speed mobile Internet access throughout mainland France, and in particular in the 70% of the less densely populated territory which would not have benefited from these services in their absence. This transition is gradually taking place in France, region by region, and allows all households to have easier access to television. It starts in 2009 and ends on 29 November 2011. It is accessible via satellite, cable, ADSL, fibre optic or via DTT.

2.3. Digital process

From 1972 to 1982, digital technology was gradually introduced in the field of video, giving rise to equipment with no analogue equivalent. Increasingly advanced synchronization units (time base correctors, synchronizers), image libraries and effect generators are making a growing breakthrough in the broadcast world. 1982 was a pivotal year in the history of television. The CCIR (Comité Consultatif International de Radiodiffusion) standardises a globally compatible digital component video format. Then, beginning in 1986, the first digital video recorder formats were introduced. The first fully digital production and post-production management systems were developed in 1987. The use of digital technology explodes creativity. From 1991 onwards, digital television became widespread in the new production centres and in the final control rooms of television channels.

Through the use of more efficient modulations, DTT allows for better image quality, reduced occupancy of the electromagnetic spectrum, lower operating costs for broadcasting and transmission once the upgrade costs are amortized. The digital signal is a discontinuous signal over time. It represents the value of a physical quantity at a given time, particularly stable. It is less fragile than the analogue signal and does not undergo distortion, which allows information preservation.

3. The evolution of TV sets

In the days of electromechanical television, television sets were sold from 1928 to 1934 in the United Kingdom, the United States and Russia. Then with the advent of CRTs, a new market developed in the second half of the 20th century. Here's an overview:

Illustration 3: Analogue to Digital conversion

Illustration 4: Television set 819 TV lines PHILIPS TF 651A from 1950 - Round CRT tube of 31 cm: Ref MW31 - VHF3 band reception, Channel FBA
However, the cathode ray tube is now ousted by flat screens (a few centimetres thick) to the point of disappearing from the French market. These flat screens are organized into image points, each of which must have its own electrical control. Two technologies are marketed.

On the one hand, the plasma screen is historically the oldest: the first was created in 1964 at an American university. It produces light by electric discharge in a gas (which ionizes and becomes plasma). The light thus produced is ultraviolet and in turn causes the luminescence of phosphors that emit visible light (red, green and blue). The advantage is good contrast and brightness. However, it also has disadvantages such as its weight, its electrical energy consumption, which leads to the end of its sale at the end of 2014.

On the other hand, LCD screens: the first ones were introduced in 1971, but it was necessary to wait until 1985 and the proposal of a flat screen of sufficient size and resolution from Matsushita for them to be usable on microcomputers. They use the properties of complex molecules (“liquid crystals”) that can, under the effect of an electric field, rotate the polarization plane of the light, thus creating an electrically controlled attenuator. Colour is obtained by means of coloured filters. LCD screens require a light source. Their contrast and brightness is rather lower than that of plasma screens, but their cost advantage has led to huge advances in technology and comparable performance.

The first commercial flat screens (14 inches, or 35.56 cm) in colour in Europe date from the end of 1995 for a price of 5,000 French francs (about €750).

The latest innovation in television sets is the 3D screen. In France, the first 3D-ready TV sets were launched in 2009. Success has not been achieved either in France or in Europe. Nowadays, this is the future sales objective: the marketing of 3D television without accessible glasses, which Philips and the Chinese TCL are working on.

4. Social impact in history

In France, in 2007 each family owned an average of 1.8 television sets, according to audit firm GfK15. According to a survey conducted in 2006 among the French, television is said to remain on for an average of six hours a day. Television is therefore one of the main media of information in Western society: it is a mass media.

First of all, to analyse the impact on health, several scientific studies have shown that excessive use leads to negative health effects, especially in children. A scientific study by Dr. Dimitri Christakis of the University of Washington, published in 2008 on the impact of television on young children (4 to 35 months) shows that “children under three years of age who watch a lot of television would have restless sleep and wake up several times during the night”. Another US
survey published in October 2007, supported by the Tamaki Foundation and the National Institute of Mental Health, of more than 1,000 parents of children aged 2 to 24 months, shows that “While television in the right amount can be useful at a certain age for children and their parents, it has been shown that excess television before the age of 3 is associated with attention control problems, aggressive behaviour and poor cognitive development”. Television is also a factor contributing to the increase in obesity, both because of the physical inactivity it causes for the viewer and because of the effect of advertising for foodstuffs that are often fatty and sweet. There is a link between high exposure to television commercials and obesity among young people aged 2 to 18.

In addition, television as a mass media has been very useful and used to shape society and control information. In an article by the guardian, Andrew Anthony says about television that it is : “the most powerful generator of our collective memories, the most seductive and shocking mirror of society, and the most virulent incubator of social trends”. He then goes on to show how television helped impose a certain model of society, citing the example of the Friends series. This series, dating back to 1994, influenced the way how people used to hang out each others, go to coffee place and have some drinks. This has benefited big companies like Costa and Starbucks who base their image on this kind of behaviour.

Pierre Bourdieu, a great French sociologist, focused on emphasizing the link between politics and television. He showed how information was and is controlled and how censorship also. For him, "television, which purports to be a recording instrument, becomes an instrument of creation of reality" and gives existence only to individuals and events likely to arouse the journalist’s interest and people how handles informations. In France, for example, between 1956 and 1959, Charles de Gaulle banned reports denouncing torture during the Algerian war.

In conclusion, television is certainly a consequence of technological progress in the field of telecommunications and digital technology, but it is also much more. It is a very important media, political and economic instrument, used by all the world's big and medium-sized powers since the second half of the 20th century and still today. It has changed the way of our entertainment, educated, communicated with each other.

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Illustrations


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