

## **Appendix 1:**

### **Evolutionary timelines for Home Entertainment Electrical and Electronic Equipment**

## 1. Evolution of audio speakers

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### 1800s

Since 1861, when Johann Philipp Reis installed the first electric loudspeaker in a telephone prototype, many scientists and inventors such as Alexander Graham Bell, Ernst Siemens and Oliver Lodge created loudspeaker designs driven by compressed air vibrating through metal horns, which were the prototypes for the modern dynamic loudspeakers. In 1895, the first commercial phonograph (i.e. turntable) was introduced.

(Techsounded, 2018; Hall, 2013)



Image 1. Edison Home Phonograph of 1890s (Library of Congress, 2018)

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### Early 1900s

In 1915, Peter Jensen and Edwin Pridham invented the first practical dynamic audio speakers. The first commercial loudspeakers were first sold in 1926 by the brand Radiola, offering a remarkably improved listening experience for consumers. From WWI until WWII, audio speaker technologies developed at a fast rate, encouraging consumer purchases. Stereo sound was developed in the mid-1930s. By 1946, phonographs were a household commodity for consumers.

(Techsounded.com, 2018; Boom Speaker, 2016; Hall, 2013)



Image 2: Radiola loudspeaker of 1926 (Radiola Guy, 2018a)



Image 3. Remler Phonograph/Radio of 1946 (Radiola Guy, 2018b)

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### Late 1900s

In the 1960s consumer electronics became mobile (e.g. pocket radios, Philips compact cassette tapes). Throughout the '60s and '70s, the on-going affordability of phonographs made them a fixture in consumers' homes. In the 1980s compact disc players were introduced, causing phonographs to go obsolete. Dolby surround-sound home sets are introduced in 1982; Stereophonic (Stereo) sound becomes available by 1986. By mid-1990s, wireless and Bluetooth speakers are introduced, reflecting the future of audio entertainment. Speakers became lighter and smaller.

(Hall, 2013; Charry, 2015; Wagner, 2017)



Image 4. Philips portable cassette recorder of 1968 (Wikipedia, 2008)

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### Modern Audio Entertainment

In the 2000s, technological advances in mobile phones instigated a change in fashion in audio speakers (i.e. in-wall speakers; sound bars) and the development of smart speakers.

(Wagner, 2017)



Image 5. Smart speaker of 2017 by Apple (Jones, 2017)

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## 2. Evolution of televisions and video players

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### 1927

The first 'mechanical' television was created. Its display screen contained a small motor with a spinning disc and a neon lamp that produced a blurred red/orange-tinted picture smaller than the size of a business card.

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### 1930s

The first 'electronic' black and white (B&W) television was perfected in Britain in 1935, with USA soon to follow (Images 1 and 2).

(Television History: A Timeline 1878-2005, 2016; Tvhistory.tv, 2018)



Image 1. British Model of 1938 (Tvhistory.tv, 2017)

Image 2. USA Model of 1939 (Tvhistory.tv, 2017)

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### 1940s

A ban of TV technology production occurred during WWII. RCA is the first company to design and manufacture a post-war TV model, selling approximately 43,000 units (Image 3). Other companies soon began to copy the RCA chassis by placing it in cabinets of their own design. After 1948, one in ten Americans owned a TV-set, and approximately 20 TV models were found on the market.

(Tvhistory.tv, 2018)



Image 3. RCA 360-TS model of 1946-1949 (Tvhistory.tv, 2018)

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### 1950s & 1960s

By 1950, there were more than 5 million TV-sets in American homes. In 1954, RCA launched the first colour television (Image 5), although colour TV sales did not make profits until the 1960's due to the large number of B&W TVs still on the market (Image 6).

(Tvhistory.tv, 2018)



Image 4. RCA CT-100 colour model of 1954 (Tvhistory.tv, 2018)



Image 5. Hotpoint B&W TV-set of 1957 (Tvhistory.tv, 2018)

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### 1970s

In 1972, Westinghouse produced the first LCD panel.

By 1973, TV sales increased exponentially, with 17,368,000 units being sold to replace the older 1950s and 60s sets.

In 1975-1976 VCRs such as Sony's Betamax video recorder and the VHS home recording format were first introduced (Images 7 and 8).

(Television History: A Timeline 1878-2005, 2016)

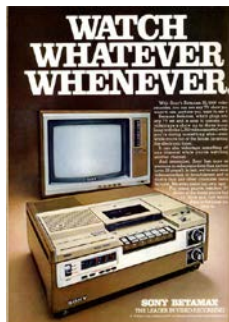


Image 6. Betamax recorder of 1975 (Flickr, 2009)



Image 7. VHS recorder of 1976 (Vintage Electronics, 2017)

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### 1980s

HDTV technology was demonstrated in the USA in 1901 by NHK.

VCR players were a staple in households until the mid-1980s. A shift to CD players is seen after their introduction in 1982, which revolutionised traditional media (Image 9).

(Monaghan, 2018; Television History: A Timeline 1878-2005, 2016; Blu-raydisc.com., 2017)



Image 8. Philips CD-100 Player of 1982 (hi-finevs, 2011)

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### 1990s

In 1991, testing of HDTV technology launched in the USA.

In 1993, RCA introduces the first widescreen (16:9 aspect) TV model.

By 1996, 1 billion TV sets were found worldwide (3). Plasma and LCD TVs were in their experimental phases, although CRT TVs still led the market.

In 1999, TiVo personal recorders were introduced, allowing viewers to record, pause, reverse or forward live shows (Image 10).

The first DVD player was introduced in 1997 (Image 11).

Digital set-top boxes were also introduced during the '90s.

(Television History: A Timeline 1878-2005, 2016; Monaghan, 2018)



Image 9. TiVo Box Set of 1999 (CNET, 2004)



Image 10. The first DVD players launched in 1997 by Sony, Toshiba and Panasonic (Stump, 2017)

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### 2000s

In 2002-2003, DVD sales surpassed VCR sales; more DVDs than videotapes were rented.

CRT TVs were being replaced by flat-screen displays (Plasma and LCD TVs; Image 12).

In 2007, Apple released their first set-top box, known as Apple TV, which launched a cascade in modern set-top boxes after 2010 (*i.e.* Google Chromecast) (Image 12).

(Television History: A Timeline 1878-2005, 2016) (Williams, 2015)



Image 11. Plasma TV of the mid 2000s (Walmart, 2010)



Image 12. Apple TV of 2007 (Williams, 2015)

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### 2010-Present

After 2010, flat-screen TVs (LCDs and LED-backlit LCDs), completely replaced CRTs.

Modern flat panel “Smart” TVs have capabilities of displaying in high-definition as well as playing content from a USB device or the internet (Image 13).

(Bogner, 2010)



Image 13. Smart TVs introduced from 2013 onwards (Y Magazine, 2016)

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### 3. Evolution of game consoles

#### 1960's: Beginning of the Production of Gaming Consoles

In 1966 Ralph Baer (an employee of defence contractor Sanders Associates) created the first “television gaming apparatus” which included a tennis game and a chase game that you attached to a normal TV set. The first game console was created to meet the US government’s demand on a device that would train the reflexes of military personnel.

#### 1<sup>st</sup> Generation Game Consoles (1972-1976)

##### 1972

The first commercial game consoles were released on the market in 1972, with Magnavox Odyssey (Image 1) and Atari PONG (Image 2). The PONG became a huge success, launching an electronic gaming revolution.

(Miller, 2005; Poh, 2017)



Image 1: Magnavox Odyssey of 1972 (Amos, 2015)



Image 2: Atari PONG of 1972 (pongmuseum.com, 2017)

##### 1976

PONG clones soon followed from several companies (e.g. Coleco’s TELSTAR; Image 3) Fairchild Camera and Instrument released the first programmable home video game system called Channel F (Image 4) in 1976.

(Miller, 2005; Poh, 2017).



Image 3: Coleco TELSTAR of 1976 (Amos, 2012a)



Image 4: Channel F of 1976 (Giant Bomb, 2017a)

#### 2<sup>nd</sup> Generation Game Consoles (GOLDEN AGE) (1977-1982)

Defined through the creation of programmable video games with better graphics and game-play.

##### 1977

Atari VCS (Image 5) kick-started the Golden Age of game consoles, and went on to sell more than 25 million units over its product lifetime accompanied with 200 different games such as Space Invaders, Asteroids, and Pac-Man

(Miller, 2005; Poh, 2017).



Image 5: Atari VCS also known as Atari 2600 of 1977 (Giant Bomb, 2017b)

##### 1978

Magnavox launched their own programmable video game console known as Odyssey 2 (Image 6). It was more popular in Europe than in the United States, where it was marketed as ‘Videopac’ by Philips.

(Miller, 2005; Poh, 2017).



Image 6: Magnavox Odyssey 2 or Videopac of 1978 (Wikipedia, 2006)

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## 1980

Mattel launched Intellivision (Image 7) video game system, which featured better graphics than the VCS, exclusive sports games (e.g. NBA Basketball, NFL Football) and was the first video game system to utilize a 16-bit microprocessor.



(Miller, 2005; Poh, 2017)

Image 7: Mattel's Intellivision of 1980 (8-bit Central, 2017)

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## 3<sup>rd</sup> Generation Game Consoles (1982-1984) (Dark Ages)

An abrupt drop in sales begins in 1982, due to the expansion of unoriginal or poor-quality gaming systems.

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## 1982

The most prominent 3<sup>rd</sup> generation gaming system was Coleco's ColecoVision (Image 8) of 1982. It featured high-quality graphics and versions of arcade favourites (e.g. Donkey Kong or Zaxxon) (Miller, 2005; Poh, 2017).



Image 8: Coleco Vision of 1982 (Watcher, 2016)

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## 4<sup>TH</sup> GENERATION (1983-1989)

Defined through technological innovations for lower-cost memory chips and higher-power 8-bit microprocessors similar to the ones of arcade machines.

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## 1983

Nintendo released the Famicom video game system to the Japanese market, selling 2.5 million units in its first year; rebranded as Nintendo Entertainment System (NES) for the US (Image 9). The NES sold more than 3 million units within its first 2 years of release in the US, and globally >65 million units throughout its product lifetime (along with 500 million cartridges) (Miller, 2005; Poh, 2017).



Image 9: Nintendo's Famicom or NES of 1983 (Byford, 2016)

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## 1989

Sega released their first game system in the US; the Sega Master System (or SMS) (Image 10) incorporating plug-in 3D glasses for certain games. Nintendo released their first programmable handheld game system, known as the GameBoy (Image 11): the world's all-time best-selling video game system.



Image 10: Sega's Master System (SMS) of 1989 (Amos, 2011a)



Image 11: Nintendo's GameBoy of 1989 (Giordano, 2016)

(Miller, 2005; Poh, 2017)

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### 5<sup>th</sup> Generation Game Consoles (1989-1995)

The 5<sup>th</sup> generation of home video game systems featured 16-bit processors, more detailed graphics, and more imaginative games.

#### 1989

NEC's TurboGrafx-16 (Image 12); marked the beginning of the 5<sup>th</sup> generation of game consoles. It was also the first console to incorporate a CD player attachment.



Image 12: NEC TurboGrafx-16 of 1989 (Amazon, 2017)



Image 13: Sega Genesis (also known as Mega Drive) of 1989 (Stein, 2017)

Sega Genesis game system (Image 13); rebranded as the Mega Drive in Japan. The game console is known for releasing the Sonic the Hedgehog game in 1991.

Nintendo launched their own 16-bit system known as the Super NES (or Super Famicom in Japan; Image 14). The console included the Super Mario World cartridge and sold 300,000 units overnight upon first release in the U.S. and approximately 46 million units worldwide throughout its lifespan.



Image 14: Nintendo's Super NES (or Super Famicom) of 1989 (Amos, 2013)

(Miller, 2005; Poh, 2017)

#### 1991

Philips released a "multimedia" system capable of playing audio CDs, CDi and CD+G software discs, VCD video CDs, and Karaoke CDs known as the CDi game console (Image 15). The product was unsuccessful because of its high price and lack of quality games (Miller, 2005; Poh, 2017).



Image 15: Philip's CDi game console of 1991 (Amos, 2011b)

#### 1993

3DO Interactive Multiplayer (Image 16); released by Panasonic was the first 32-bit system released in the U.S. (Miller, 2005; Poh, 2017).



Image 16: 3DO game console released by Panasonic in 1993 (Amos, 2012b)

### 6<sup>th</sup> Generation Game Consoles (1995-1998)

Featured high-powered microprocessors, very realistic graphics and game-play; outperforming most personal computers of the day.

#### 1995

Sony released their first video game system, the PlayStation (Image 17), incorporating a 32-bit microprocessor. Backed by a large advertising campaign, the console unseated Nintendo and Sega to become the leading home video game system, selling more than 50 million units worldwide.



Image 17: Sony's PlayStation of 1995 (Amos, 2010)

Nintendo launched Virtual Boy, kick-starting consumer-focused Virtual reality gaming (Image 18).



Image 18: Nintendo's Virtual Boy of 1995 (Seibert, 2017)

(Miller, 2005; Poh, 2017; Brown, 2018)

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**1996**

Nintendo released their own sixth-generation game system, the Nintendo 64 (Image 19), incorporating a 64-bit microprocessor. The launch was hugely successful, with 1.7 million units sold in the first three months of release. (Miller, 2005; Poh, 2017)



Image 19: Nintendo 64 of 1996 (Amos, 2011c)

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### 7<sup>th</sup> Generation Game Consoles (1998-2005)

Video games feature even better graphics, performance, and game play; Microsoft was introduced in the video gaming industry.

**1999**

Sega released their Dreamcast system (Image 20), incorporating a 128-bit microprocessor and 26MB memory, the Dreamcast ran on Microsoft's Windows CE platform.

(Miller, 2005; Poh, 2017)



Image 20: Sega's Dreamcast game consoles of 1999 (Jarrard, 2017)

**2000**

Sony released the PlayStation 2 console (PS2; Image 21), powered by a 128-bit "Emoticon Engine" microprocessor and 32MB memory. It sold >1 million units within the first two days of release in Japan, and more than 500,000 units in the USA, thus dominating the video gaming market.

(Miller, 2005; Poh, 2017)



Image 21: Sony's PlayStation 2 of 2000 (Sony, 2018)

**2001**

Microsoft entered the video game market with the highly anticipated Xbox system, which incorporated a 733MHz Pentium III microprocessor. The Xbox sold approximately 10 million units worldwide within the first two years of release (Image 22).



Image 22: Microsoft's Xbox system of 2001 (Amos, 2014)

Nintendo released the GameCube. The GameCube was Nintendo's first non-cartridge system and sold more than 500,000 units within the first week of release, totalling up to 13 million units 2 years after its release (Image 23).

(Miller, 2005; Poh, 2017)



Image 23: Nintendo's Game cube of 2001 (Amos, 2012c)

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## Towards the 8<sup>th</sup> Generation of Game Consoles (2005-Present)

Currently there are 3 major competitors in the market: Microsoft's Xbox series, Sony's PlayStation series and Nintendo.

### 2005

Microsoft released the original Xbox360 (Image 24), which sold over 80 million units worldwide throughout its product lifetime. Slimmer and more advanced models of the Xbox360 were released in 2010 and 2013 (Image 25) (Poh, 2017).



Image 24: Xbox 360 Original game console of 2005 (Fernandez, 2017)



Image 25: Xbox360 Slim of 2013 (Amos, 2011d)

### 2006

Nintendo released the Wii game console (Image 26) selling more than 100 million units throughout its product lifetime; popular due to the huge variety of games it incorporated (Poh, 2017). Sony released PlayStation 3 (PS3; Image 27) with sophisticated 60GB hard-drive and wireless internet capabilities. (Altizer, 2017).



Image 26: Nintendo Wii of 2006 (Amazon, 2018a)



Image 27: Sony's PlayStation 3 of 2006 (Lifewire, 2017)

### 2013

Microsoft released Xbox One (Image 28), marking the 8<sup>th</sup> Generation of video game consoles. So far, the game console has sold approximately 30 million copies worldwide (IGN, 2013). Sony released their 8<sup>th</sup> generation video game console, named PlayStation 4 (PS4; Image 29) (Court, 2013).



Image 28: Microsoft's Xbox One of 2013 (Amazon, 2018b)



Image 29: Sony's PlayStation 4 of 2013 (Game Radar, 2015)

### 2017

Nintendo released their newest game console, the Switch (Image 30) acting as the first 'hybrid' console, which allows for both portable gaming through a 6.2-inch display, as well as home video gaming through its detachable hand-sets (Nations, 2017).



Image 30: Nintendo Switch gaming console of 2017 (Two Honest Guys, 2017)

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