

Live Caption Quality Monitoring on Australian Free-to-Air Television

Katie Ellis, Kai-Ti Kao, Gwyneth Peaty and Kathryn Locke

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“Live Caption Quality Monitoring on Australian Free-to-Air Television”

Authored by Katie Ellis, Kai-Ti Kao, Gwyneth Peaty and Kathryn Locke

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Centre for Culture and Technology (CCAT)

Curtin University

Website: <https://ccat.curtin.edu.au/>

Email: katie.ellis@curtin.edu.au

Telephone: +61 8 9266 2509

Australian Communications Consumer Action Network

Website: www.accan.org.au

Email: research@accan.org.au

Telephone: +61 2 9288 4000

If you are deaf, or have a hearing or speech impairment, contact us through the National Relay Service: <https://www.communications.gov.au/what-we-do/phone/services-people-disability/accesshub>

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Foreword

This research was conducted by researchers situated in the Digital Disability program in the Centre for Culture and Technology (CCAT) at Curtin University.

CCAT is located at the intersections of disciplinary and creative boundaries and operates as a portal to cutting-edge research in media, digital practices, culture, theory and digital technologies.

CCAT focuses on national and international research collaboration in cultural, media and journalism research, the creative economy and cultural science. CCAT research is motivated by the proposition that the study of culture, with its emphasis on identity, meanings, relationships, power and values, needs to be better integrated with the study of media and digital technologies, especially the internet.

CCAT Director Associate Professor Katie Ellis also leads the Digital Disability program in the Centre. This program explores the role of culture and technology in both creating and alleviating disability through digital television, web capable devices, smartphones, captions, audio description, gaming, artificial intelligence and the internet of things. Projects focus on disability and digitisation and the importance of accessibility for people with and without disability.

The current report is a progression of this program's work on captions in both higher education and digital television.

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Key researchers on this project were Gwyneth Peaty, Kai-Ti Kao and Chris Mason. The final report was formatted and proofread by Ceridwen Clocherty. We also thank Brendan Ameduri for his expert technical advice.

Executive Summary

Captions are the text version of the audio component of audio-visual media such as television. Captions are displayed on the screen primarily to provide access for audiences who are Deaf, deaf or have hearing loss. Captions were first introduced on Australian free-to-air television in 1982. However, it was not until 1998 that the provision of captions was regulated under an amendment to the Broadcasting Services Act (1992). Another amendment in 2014 introduced the requirement that captions be made available on 100% of content screened on the primary digital channels of Australian free-to-air television between 6am and midnight. This regulation also applies to live television and therefore necessitates the provision of live captioning. Live captions are captions that are created by typing, stenocaptioning or respawning at the time of broadcast.

The statutory authority, the Australian Communications and Media Authority (ACMA), regulates and enforces caption quality and consistency in Australia. The ACMA's Television Caption Quality Standard (the Standard) came into effect in 2013 and determines quality on the basis of three factors – readability, accuracy and comprehensibility. Anecdotal evidence suggests live caption quality is poor in certain circumstances, and that when caption quality is poor consumers are unable to follow the program. Prior research confirms the importance of captioned television to feelings of social inclusion to members of the population who are Deaf, deaf or have hearing loss. This demand for captions shows that people who are Deaf, deaf or have hearing loss comprise a key audience demographic that must be taken seriously by broadcasters.

The quality of live captions depends on the provider, the technology used and the personnel, and can vary greatly across both broadcaster and program genre. This report details the findings of a content analysis of live caption quality on Australian free-to-air television airing in February and March 2019. A total of 20 hours of programming across the five main channels on free-to-air television – ABC, SBS, Seven (7), Nine (9) and Ten (10) – were analysed against a tracking sheet that was based upon elements of the Standard. The sample included four genres – breakfast / other, commentary, news and sport.

The researchers conducted a qualitative and quantitative content analysis of the incidence of errors occurring in the live captioning track. A total of 4 hours of content from each of the five channels was assessed. This comprised of 2 hours of content per channel each week for 2 weeks. The same program was then reassessed between 3 and 14 days later.

Each program was recorded at the time of broadcast and was assessed by three different individual coders. In order to avoid bias, each coder collected data individually and watched the program twice – firstly with the sound off (visual only) and secondly with the sound on (visual and audio).

To summarise the findings:

Legibility:

- The legibility of captions tended to be good quality across the board, with the exception of the length of time captions appeared onscreen and the tendency to

obscure onscreen graphics with captions.

Speech:

- Most of the errors were in the speech category.
- The errors in the speech category went across all four subcriteria – missing words, spelling errors, unclear distinction between speakers, and issues with sync.
- A lag of between 2 and 10 seconds occurred across the genres.

Non-speech:

- There were few errors in the non-speech category; however, music and sound effects were at times left out of the captioning track.

Overall:

- Significant nuance is lost when watching programs exclusively with captions which can make it difficult to follow programs.
- Captions were not always verbatim.
- The reassessment of programs with the audio turned on revealed significantly more errors.
- On average the genres with the most errors were commentary (23) and sport (22), followed by news (15.5) and breakfast (15). These numbers are significant given that only half an hour of the programs were assessed for this project.
- The coders believed sport and news programs were the easiest to understand via the captions track alone.
- The coders believed breakfast and commentary programs were the most difficult to understand via the captions track alone.
- The coders believed that Channel 7 tended to have higher quality live captions when compared to the other broadcasters.
- The coders believed that Channel 9 tended to have lower quality live captions when compared to the other broadcasters.
- There was some minor evidence of censoring.
- The commercial breaks were irregularly captioned.
- Any prior access to content – for example in the news and commentary genre – did not necessarily improve the quality of captions and in fact tended to introduce new errors such as captions preceding content or content that was not ultimately screened being captioned.
- While errors were consistently identified by the three individual coders, each had a different view on un/acceptable captioning.
- The number of errors in a single subcategory varied between 0 and 34.

The report concludes with the following recommendations:

Recommendation 1

The current project adopted a mixed qualitative and quantitative approach to the collection of data, based upon criteria provided by the ACMA's Television Captioning Quality Standard (the Standard). However, the Standard is by nature a qualitative measure. We recommend a review of the Standard to establish and quantify an acceptable number of errors given the demands of both live broadcasting and the needs of the audience.

Recommendation 2

Currently caption users wishing to make a complaint about poor quality live captions must complain to the broadcaster before lodging a complaint with the ACMA. Given that this project found that errors are quite common in live captioned programs, we recommend that the ACMA undertake monitoring of live captions. This would reduce the burden on consumers to make and follow up on complaints, and could help to ensure greater comprehensibility of live captioned programs for people who rely on captions.

Recommendation 3

Within live television, a certain degree of captioning error is to be expected; however, to understand what is and is not an acceptable level of errors and lag we recommend a second stage to this study where audiences who are Deaf, deaf and have hearing loss are invited to give their feedback regarding the quality of live captioning identified. This second phase study should be funded by the ACMA and should inform any review of the Standard.

Recommendation 4

Increasingly Australians are accessing free-to-air television via catch-up or so-called over-the-top television offerings. These, like the digital multichannels, are exempt from captioning regulations. We recommend a comparative study that first establishes whether captions are offered online and secondly compares their quality to live broadcast television.

Recommendation 5

While not a focus of this study, it was noted that only big brands offered captioned commercials and even these were inconsistent. Similarly, promotions for upcoming programs were uncaptioned. We recommend analysis of the effectiveness of captioned advertising amongst both hearing and non-hearing audiences.

Recommendation 6

None of the programs coded in this analysis were of an emergency nature; however, given the plethora of errors identified, a dedicated analysis of live emergency broadcasts including audience responses is essential.

Recommendation 7

Significant advancements are being made in the area of artificial intelligence and machine learning as a tool to assist in the creation of accurate captions. There are also moves internationally to utilise machine learning as a way to address the delays often experienced in live captioning, despite community concerns about the use of Automatic Speech

Recognition.¹ With delays of between 2 and 10 seconds consistently identified throughout this project, we recommend the broadcasters investigate the potentials of artificial intelligence.

¹ See for instance the World Federation of the Deaf and International Federation of Hard of Hearing people Joint Statement: Automatic Speech Recognition in Telephone Relay Services and in Captioning Services, available: <http://wfdeaf.org/news/resources/27-march-2019-wfd-ifhoh-joint-statement-automatic-speech-recognition-telephone-relay-services-captioning-services/>

Introduction

Captions are the text version of the audio component of television which are displayed on the screen primarily to provide access for audiences who are Deaf, deaf or have hearing loss. Captions were first introduced on Australian free-to-air television in 1982. However, it was not until 1998 that the provision of captions was regulated under an amendment to the Broadcasting Services Act (1992)². Another amendment in 2014 introduced the requirement that captions are made available on 100% of content screened on the primary digital channels of Australian free-to-air television between 6am and midnight. This regulation also applies to *live* television and therefore necessitates the provision of live captioning. Live captions are captions that are created by typing, stenocaptioning or respeaking at the time of broadcast.

The statutory authority, the Australian Communications and Media Authority (ACMA), regulates and enforces caption quality and consistency in Australia. The ACMA's Television Caption Quality Standard (the Standard) came into effect in 2013 (Federal Register of Legislation, 2013). Quality is determined by three factors – readability, accuracy and comprehensibility. Readability quality is determined on: colour and font; natural linguistic breaks and natural flow and punctuation of a sentence; standard punctuation rules; positioning of captions; and line length (no more than three lines per screenview³). Accuracy is determined by the quality of the re-creation of the soundtrack of a program, including: that all spoken content is captioned verbatim or, if this is not possible, it reflects the actual meaning of the spoken content; that, if non-verbatim captions are used, the intended audience is considered (for example children); that the manner and tone of the speaker is conveyed; and that sound effects and/or music have been described. The quality of the comprehensibility of captions is determined by: the ability to identify and distinguish individual speakers, including off-screen or off-camera voices; the caption display time being sufficient for reading purposes⁴; the timing in relation to the caption onset and end of speech/music/sound effect; the accuracy of spelling; the use of captioned explanations for long pauses in speech in programs; the containment of captions within a scene, that is

² Part 9D: "Broadcasters must comply with rules and standards relating to captioning of television programs for the deaf and hearing impaired."

Captioning obligations (Broadcast) – basic rule

Each commercial television broadcasting licensee, and each national broadcaster, must provide a captioning service for:

- (a) television programs transmitted during designated viewing hours; and
- (b) television news or current affairs programs transmitted outside designated viewing hours.

Captioning obligations (Subscription) – basic rule

(1) If a subscription television licensee provides a subscription television service in a financial year, the licensee must ensure that the percentage worked out using the following formula is not less than the annual captioning target for the service for the financial year: (Total captioned hours / total program hours) X 100.

³ This follows advice from the UK.

⁴ In the UK, the advice is that the speed should not normally exceed 160-180 words per minute for pre-recorded programs (2-3 words per second). They acknowledge that it may not be possible to restrict the speed for live programs.

whether a caption over-runs a shot or scene change; and the alignment of the captions with relevant shot or scene changes.

In 2016 the ACMA initiated a review of the Standard with specific reference to the quality of captions for live television programs versus pre-recorded television programs (ACMA, 2016). The only amendment to the Standard came in the form of a 'note' added to section 6, which stated (Federal Register of Legislation, 2016):

Whilst noting that it is not authorised to determine that a lower quality of captioning service is acceptable for a kind of program or program material (see subsection 130ZZA(2B) of the Act), in determining this Standard, the ACMA has considered the differences (including time constraints for live content) between providing captioning services for live and pre-recorded television programs; and wholly live or wholly pre-recorded television programs and television programs that include both live and pre-recorded program material (see subsection 130ZZA(2A) of the Act).

Another significant part of the review of the Standard was to determine whether the way the quality of captioning is measured should change. The continued use of a “meaningful access test” – which considers a broad range of factors in analysing quality, including taking into account the difference between live and pre-recorded programs – was decided over the use of a metric approach which would utilise specific measurements for quality. Importantly, however, the Standard does not explicitly state how these differences are to be considered or applied to live versus pre-recorded programs. The ACMA only notes that the “circumstances” of a program are considered, specifically that, “It is reasonable to expect that the captions for a live broadcast of a fast paced sporting program may lag behind the commentary, but they must still be meaningful to viewers”. Additionally, if viewers want to make a complaint about any captioning, they can refer to the ACMA’s brochure regarding the captioning rules and how complaints can be made, or access the ACMA’s online form (ACMA, n.d.). However, again, no specific reference is made as to whether the complaint relates to live or pre-recorded captioning.

It is important that a distinction is made between these – by its very nature, live captioning can be subject to many more issues regarding quality. In an interview with the media accessibility advocacy organisation Media Access Australia (2012), the television project manager Chris Mikul explained that one of the challenges of live captioning has been the shift from the use of professional stenographers to that of speech recognition software. While he argues there has been a significant improvement in this area for captioning more generally, there still remain issues with the quality of live captioning. This was also brought up as one of the key six areas which should be examined in relation to the future of live captioning at the 2015 Citizen Conversation on Live Caption hosted by the ACMA as part of their public and key stakeholder consultation process regarding the Standard. The other issues highlighted were: the timing lag in live captions; the possibility of ‘perfecting’ live captions, noting that a 95% accuracy rate is a popular worldwide standard, yet that viewer understanding of information measured by the NER (number, edition error, recognition error) model follows another method; the impact of the use of different platforms for viewing television as not all are subject to captioning regulations; the impact of viewers customising displays; and the options for multi-language live captions.

All of these issues potentially impact the target audience's ability to understand content clearly and therefore follow the program. This is of particular importance in times when critical information is relayed over television, for example during bushfires or other emergency situations. However, it must also be noted that captions are not just there for extra information. They also ensure access to television as a key site of social inclusion. That is, the initial target audience was considered to be limited to those who are Deaf, deaf or have hearing loss, facilitating their access to television as a social and informative medium. However, television captions are increasingly accessed by a much wider consumer cohort, including people from culturally and linguistically diverse backgrounds, those with learning or cognitive disability, older people, children, as well as those viewing television in noisy environments.

There are two companies providing live captioning in Australia – Red Bee Media and AI Media. Their specific live captioning procedures are not outlined on their websites; however, some details regarding their practices are.

Red Bee Media's live captioning service covers all live events, including those broadcast via online platforms like Facebook and YouTube. They boast accuracy levels in excess of 98%. They do not rely on automatic speech recognition (ASR) but do utilise part of speech recognition technology to align pre-prepared captions with the audio of a live television program. They also state they are working with industry to improve speech technologies and ASR accuracy – “the quality of text that even the best ASR engines produce is [currently] far below what would be considered acceptable by end-users of captioning, except in some very narrow and ideal conditions”. They also use a remote service (live remote captioning) which allows users to access captioning via a ‘conference call’ – users can log on to a website that provides real-time live transcription. Red Bee Media notes it provides this service for users who are Deaf, deaf or have hearing loss at conferences or meetings, but it is also beneficial in providing accurate and live ‘meeting minutes’ for users without disability or for people with English as an additional language. They state captioners work at 220 words per minute and at 99% accuracy.

AI Media has a broad portfolio of providing live captioning for broadcasters and subscription television. They use respeaking technology – where the captioner repeats what is heard into voice recognition software – and stenography. They also use CART – a live speech-to-text platform via audio platforms, for example phone calls, webinars, Skype etc. – in which live captioners provide captions in real time to the user's device. A transcript of captions is also sent at the end of the service. Specifics about accuracy and live television procedures are not provided on their site.

The quality of live captions therefore depends on the provider, the technology used and the personnel and, as such, can vary greatly across both broadcaster and program genre. This report details the findings of a content analysis of live caption quality on Australian free-to-air television airing in February and March 2019. A total of 20 hours of programming across the five main channels on free-to-air television – ABC, SBS, Seven (7), Nine (9) and Ten (10) – were analysed against a tracking sheet that drew on elements of the Standard. The sample included four genres – breakfast / other, commentary, news and sport.

Literature Review

Despite technological change, broadcast television remains the most watched medium for Australian audiences, particularly for news, sport and commentary. However, a review of the literature reveals some key issues regarding the captioning of television, namely the:

- Disconnection between broadcasters and the needs of audiences who are Deaf, deaf or have hearing loss, particularly regarding the vital role that captions play in terms of social inclusion
- Accuracy of captions
- Technological solutions to live captioning
- Mainstream potential of captions.

There exists a significant body of academic work emphasising the importance of captioned television to feelings of social inclusion to members of the population who are Deaf, deaf or have hearing loss, including several papers by members of this research team (Downey, 2008; Ellis, 2014; Ellis, Kent, Locke, & Latter, 2017; Merchant, Ellis & Latter, 2017). However, despite this demand, broadcasters continue to overlook this group as a serious audience demographic (Ellis & Goggin, 2015; Ellcessor, 2011; Ellis, 2019). As a result, the Deaf and deaf communities continue to advocate for the legislated provision of this accessibility feature on broadcast television (Downey, 2008; Ellis & Kent, 2015; Ellis & Goggin, 2015; Gregg, 2006).

Furthermore, as captions have become more widely available, expectations regarding their accuracy have changed. Deaf and deaf audiences acknowledge that during the 1980s they were happy with whatever captions they could get, at whatever quality (Newell, 1982). However, this is not the case today as audiences are willing to complain to regulators and litigate.

The last 3 years has seen a shift in the technology available when live captioning. For example, the potential for artificial intelligence and machine learning to provide more accurate captions – as well as reduce latency in live captioning – has featured in both the academic literature and trade press. In 2016 Ericsson partnered with the BBC to create a new method of live caption that aimed to minimise “the delay between live captions and the audio they represent by utilizing the time taken to compress the audio and video streams for transmission and distribution” (Ericsson, 2016). Indeed, a comprehensive machine learning system had been proposed a decade earlier in order to leverage a wider audience for people engaging the captions track such as those speaking another language (Yuh & Seo, 2006).

Potential audiences for captioning have also shifted. Captions are now also acknowledged as appealing to a more mainstream potential audience. They have become increasingly popular through their use on social media sites such as Facebook, particularly following the introduction of Facebook’s autoplay function. Research suggests mainstream consumers are 12% more likely to engage with an online video if captions are available, therefore making captions an attractive feature (Facebook Business, n.d.). In fact, 85% of Facebook users

watch video with the sound off (Huxley, 2018). This mainstream use has also been embraced by Netflix users (Kehe, 2018; Farley, 2017; Ellis, 2019) and could potentially be useful for traditional television broadcasters, particularly with reference to live television such as news or sport programs.

Methodology

This research analyses the five main channels on free-to-air television – ABC, SBS, 10, 7 and 9. A range of live-captioned television genres – breakfast / other television, commentary, news and sport – was sampled.

Phase 1 – Identification of Content / Development of Data Collection Tool

The selection of programming to be analysed was made on the basis of three criteria:

- Their status – whether they are captioned *live*
- Their genre – as selected by ACCAN and identified above
- Their ratings – popular programming was selected.

Table 1. Program title according to broadcaster and genre

Genre	ABC	SBS	7	9	10
Breakfast / other	<i>ABC News Breakfast</i>	<i>Al Jazeera News</i>	<i>Sunrise</i>	<i>Today</i>	<i>Studio 10</i>
Commentary	<i>Q&A</i>	<i>Speedweek</i>	<i>Weekend Sunrise</i>	<i>Weekend Today</i>	<i>The Project</i>
News	<i>ABC News WA</i>	<i>SBS World News</i>	<i>7 News WA</i>	<i>9 News WA</i>	<i>10 News WA 4pm</i>
Sport	<i>Women's Australian Open (Golf)</i>	<i>Premier League</i>	<i>Big Bash</i>	<i>Rugby</i>	<i>A-League</i>

Table 2. Program screening date

Genre	Program	Date
Breakfast / other	<i>ABC News Breakfast</i>	27 February 2019
	<i>ABC News Breakfast</i>	6 March 2019
	<i>Al Jazeera News (SBS)</i>	27 February 2019
	<i>Al Jazeera News (SBS)</i>	6 March 2019
	<i>Sunrise (7)</i>	26 February 2019
	<i>Sunrise (7)</i>	5 March 2019
	<i>Today (9)</i>	26 February 2019
	<i>Today (9)</i>	3 March 2019
	<i>Studio 10</i>	26 February 2019
Commentary	<i>Studio 10</i>	5 March 2019
	<i>Q&A (ABC)</i>	18 February 2019
	<i>Q&A (ABC)</i>	25 February 2019
	<i>Speedweek (SBS)</i>	10 February 2019
	<i>Speedweek (SBS)</i>	26 February 2019
	<i>Weekend Sunrise (7)</i>	2 March 2019
	<i>Weekend Sunrise (7)</i>	9 March 2019
	<i>Weekend Today (9)</i>	2 March 2019
	<i>Weekend Today (9)</i>	9 March 2019
<i>The Project (10)</i>	18 February 2019	

Genre	Program	Date
	<i>The Project (10)</i>	25 February 2019
News	ABC News WA	13 February 2019
	ABC News WA	18 February 2019
	SBS World News	10 February 2019
	SBS World News	13 February 2019
	7 News WA	18 February 2019
	7 News WA	25 February 2019
	9 News WA	18 February 2019
	9 News WA	25 February 2019
	10 News WA 4pm	18 February 2019
	10 News WA 4pm	25 February 2019
Sport	Women's Australian Open (Golf) (ABC)	14 February 2019
	Women's Australian Open (Golf) (ABC)	17 February 2019
	Premier League (SBS)	10 March 2019
	Premier League (SBS)	17 March 2019
	Big Bash (7)	9 February 2019
	Big Bash (7)	15 February 2019
	Rugby (9)	14 March 2019
	Rugby (9)	21 March 2019
	A-League (10)	16 February 2019
	A-League (10)	23 February 2019

A data collection tracking sheet was devised in consultation with ACCAN (see Appendix 1). Live captioning on Australian free-to-air television is typically conducted by AI Media (Channels 7 and 9) and Red Bee Media (ABC, Channel 10 and SBS) and, as such, their guidelines regarding live captioning were also considered when assessing the quality of captions. For example, AI Media stipulate sarcasm must be noted, yet preliminary research for this project indicated sarcasm is rarely noted.

These guidelines and the Standard helped the project team, in consultation with ACCAN, to devise the data collection tracking sheet used in this research (see Appendix 1). While the entire Standard was not reflected in the tracking sheet, the programs selected were analysed according to four key criteria based on information set out in the Standard. These criteria were selected to ensure data was collected about the readability, accuracy and comprehensibility of the captions:

- Legibility: e.g. Are the caption fonts and colours legible? Are captions longer than three lines in length?
- Speech: e.g. Do the captions clearly identify and distinguish individual speakers? Is each new speaker identifiable, including on-screen and off-camera voices?
- Non-speech: e.g. Have sound effects and/or music not observable from the visual action been captioned?
- Overall reflection of content: e.g. Are the captions always verbatim?

Phase 2 – Content Analysis

The researchers conducted a quantitative content analysis of the incidence of errors occurring in the live captioning track. The tracking sheet was used to assess a total of 4

hours of content from each of the five channels. This comprised of 2 hours of content per channel each week for 2 weeks. Another episode of the same program was then reassessed between 3 and 14 days later.

If the program ran for longer than half an hour then a half an hour segment of the program coded was decided in the following way:

- Breakfast: Typically, these shows were aired at the same time. The programs were coded from 8:00am which was later in the program as we anticipated more people would be watching
- Commentary and News: As programs were aired at different times of the day, the first half an hour of each program was recorded
- Sports: programs were coded when the actual game started

Each program was recorded at the time of broadcast and was assessed by three different individual coders. In order to avoid bias, each coder collected data individually and watched the program twice – firstly with the sound off (visual only) and secondly with the sound on (visual and audio).

The programs were coded by three individual research assistants – two females, one male. Coder A took a mixed quantitative and qualitative approach, Coder B took a quantitative approach while Coder C took a qualitative approach. Coder C's comments are referenced throughout this report to illustrate the frustration some experience engaging with at times inaccurate captions. Each coder noted errors and reflected on the experience of accessing captions. It should be noted that none of the coders are Deaf, deaf or have hearing loss, so they lack caption literacy to a certain degree. Despite this, the coders are highly educated and literate in the English language. As such the coders may have understood the captions and programs to a greater degree than people with lower levels of English literacy, such as Auslan users for whom English is a second language.

Results

This section reports findings of and offers discussion about the content analysis of live captioning quality on Australian free-to-air television across the genres of breakfast television, commentary, news and sport.

Captions were assessed on the basis of legibility, speech, non-speech and overall comprehension. Common issues in the legibility category included caption length, captions not being onscreen long enough to read, and captions and other onscreen graphics being obscured.



Screenshot 1: Captions obscuring content in *10 News WA* – 25 February 2019 ©Channel 10

In the speech category there were frequent examples of missed words, incorrect spelling, unclear distinction between individual speakers, and regular issues with lag.



Screenshot 2: Lag and non-verbatim captions in *ABC News Breakfast* – 18 February 2019 ©ABC

While a good effort was made to caption non-speech content such as sound effects and music, this did not always take place. Captions were not always verbatim and, although efforts were made to reflect the content, this was at times heavily abbreviated.



Screenshot 3: Spelling errors and abbreviated content in *9 News WA* – 18 February 2019 ©Channel 9

Summary of Broadcaster

While quantitative errors were fairly consistent across the coders (see Appendix 2), results varied as to whether coders felt that a program could be understood exclusively via the caption track. Results therefore have been decided on a ‘majority rules’ basis.

Table 3: Response across all broadcasters to the question ‘Can the program be understood by relying exclusively on the captions?’

BROADCASTER RESPONSE	ABC		SBS		Channel 7		Channel 9		Channel 10	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Genre										
Breakfast / other		✓	✓		✓			✓		✓
Commentary		✓	✓		✓			✓		✓
News	✓		✓		✓		✓		✓	
Sport	✓		✓		✓			✓		✓

Channel 7 and SBS were both consistently understood via the caption track across all four genres. The ABC fared relatively well, being understandable exclusively via the captions in two of the four genres. Channels 9 and 10, however, were considered understandable via the captions only during the News.

In some instances, one week of commentary was considered understandable, while the other week was not. The coders were asked to reassess this question in light of this. Coder B summarised the consensus of the group:

... all of these programs, for me, have a consistent “glitch”. I would have to say as a result of this and just on captions alone, they are not understandable. A general sense of what is going on, yes, but I don’t think this is enough. As a simple quality control issue if nothing else, I think this is poor.

Pause/rewind would probably aid meaning but we are obviously talking about a live viewing, so the detail that is lost through the “missing” captions would lead me to conclude this.

In a lot of these cases, the details are really important to the content – the NRL being the possible exception because you can see the on-field action on screen. Context is the issue here, particularly for a program like Q&A where people are arguing, asking questions etc.

Coder A added:

Q&A lost a lot of nuance in the captions, and they were dealing with complex themes where caption issues such as lag, skipping and abbreviating were a massive problem. While the other commentary shows and *Studio 10* didn’t deal with the same level of complex material, I’m still not convinced that the live captioning captured everything. So similar to what [Coder B] is saying, while they may have been “understandable” in a very general sense, enough is lost that I don’t believe it’s a viable substitute. Definitely not in the way that Closed Captioning is for non-live TV.

While the captions often still reflected the intent of the programs, the heavily summarised approach in some programs and particularly Q&A was frustrating for all three coders. At times these summaries could be interpreted as a form of censorship. For example, “bitchy” was substituted with “annoying” on *The Project* on 18 February and the word “rubbish” was used in lieu of “bollocks, absolute bollocks” on *ABC News Breakfast* on 27 February. This approach to captioning has previously been identified by Deaf and deaf communities as unacceptable (Ellis & Kent, 2015).

Although the coders reported that programs could be broadly understood without audio, a significant amount of nuance is lost when the captions provide the only source of communicative information. There was some disagreement amongst the coders who did not discuss their findings with one another. Disagreements existed because opinions diverged on where they drew the ‘Can I understand this?’ line. For example, Coder B’s criteria was a little looser than Coder A when it came to assessing whether something made sense, choosing an opinion that equated to ‘Can I roughly understand what is going on?’, whereas Coder A operated on the assumption that a full understanding of all details was essential. Coder C offered some middle ground and decided a program could not be followed when the content had become generally incomprehensible enough times that the program could not be consumed without immense frustration. Significantly, if re-watching the program with sound on yielded significantly more errors, missed words and non-verbatim captioning than a program considered understandable without sound, it was moved to the ‘could not be understood’ category.

Given these disagreements between coders and the subjective nature of the question, it is useful to assess comprehensibility against other measures that are outlined in the Standard. The tracking sheet captured data about four of the Standard’s comprehensibility criteria, including whether the captions were on screen long enough to read, whether captions were spelt correctly, whether captions clearly identified and differentiated between different speakers, and whether the captions were in sync with the corresponding speaker. These findings were used alongside the subjective judgements of the coders to establish an overall comprehensibility rating for the broadcasters in each of the genres. If a program scored positively against more than three of these five criteria, it was considered to be generally comprehensible without audio.

Table 4: Response across all broadcasters when considering all comprehensibility criteria

BROADCASTER RESPONSE	ABC		SBS		Channel 7		Channel 9		Channel 10	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Genre										
Breakfast / other		✓	✓			✓		✓		✓
Commentary		✓		✓		✓		✓		✓
News		✓		✓		✓		✓		✓
Sport		✓	✓		✓			✓		✓

These findings illustrate that a range of factors impact the overall comprehensibility of captions. When assessing captions against the five comprehensibility criteria, none of the programs from the ABC or Channels 9 or 10 are entirely comprehensible without sound. Channel 7 performs slightly better, with their sport program being comprehensible without sound. SBS performs best out of the broadcasters, with their sport and breakfast programs being generally comprehensible through the captions alone. It is worth interrogating the comprehensibility of captions for sports programs, however, as it is possible that the visual nature of sport leads to greater comprehension in and of itself.

As outlined in the Standard, comprehensibility is only one factor to be considered when determining the quality of captions. Generally speaking, despite many instances of on-screen visuals or text being obscured, the captions were fairly readable. With regards to accuracy, the captions were often not verbatim, sound effects and music were not always captioned, and the captions did not always adequately reflect the content of the program. The individual findings for each program and broadcaster can be assessed to consider the quality of captions in more detail, with the tables below reflecting the findings from when the program was viewed with sound. The following sections discuss findings as they relate to each specific genre.

Summary of Program Genre

Breakfast / Other

Breakfast television is a uniquely televisual genre present across all the broadcasters, with the exception of SBS which does not have a breakfast television offering. In lieu of breakfast television, *Al Jazeera News*, which airs at 6:30am, was evaluated.

Table 5 shows the overall coders' findings against the data collection tracking sheet for the category of breakfast / other programs. The average number of errors across both weeks and the three coders was 15.

Al Jazeera News (SBS) was identified as the easiest to follow, perhaps because they had very few instances where there was more than one speaker/sound at a time. According to Coder C:

Overall, *Al Jazeera* has the best captions in my opinion. They are concise and clear, don't move too fast, and are reasonably in synch with the action on screen.

There was high correlation amongst the coders regarding when the program could be understood via the caption track alone. For example, despite some issues with lag all coders thought *Al Jazeera News* (SBS) and *Sunrise* (7) could be understood via the caption track alone. The lag only became obvious when watching with sound as Coder C explains:

There is significant lag [on *Sunrise*], which becomes more obvious once the sound is turned on.

Omission of detail [on *Al Jazeera News*] due to lack of time becomes obvious when viewing with sound [...] Some lag noted, but not as severe as on other channels.

By comparison, none of the coders believed the *Today show* (9) could be understood via captions alone. As Coder C reflected:

Sometimes [captions] skip forward too fast to read, then lag and sit on screen for too long; overall a frustrating viewing experience.

Skipping ahead and lagging behind – hard to keep up!

The majority of errors in this category related to spelling errors and persistent lags. While more errors were noted when the audio was engaged, no new categories of errors emerged.

As these ABC screenshots demonstrate, frequently captions obscured other graphics. In addition, captions were not always verbatim and were heavily summarised to reflect content.



Screenshot 4: Non-verbatim captions in *ABC News Breakfast* – 18 February 2019 ©ABC



Screenshot 5: Captions obscuring content in *ABC News Breakfast* – 18 February 2019 ©ABC

Of the distinctively breakfast television offerings, *Sunrise* (7) was identified as being of the highest quality; however, there were sections where the captions *preceded* the audio content, suggesting that perhaps the captioning wasn't all live. While *Today* (9) was identified as the most difficult to follow without audio, even *ABC News Breakfast* and *Studio 10* (10) were difficult to follow due to persistent issues with lag and captions scrolling too quickly to catch up. Coder C took issue with the tendency of both programs to omit words:

Words are left out [of Studio 10] throughout, which makes the whole program difficult to follow using captions alone.

It's very difficult to figure out who is saying what once the group start interacting [on Studio 10] [...] As soon as the hosts start interacting, the captions become increasingly difficult to follow. Casual conversation is not translated well and can appear strange in text, especially when words are missing.

Lots of words left out [on ABC News Breakfast] – very confusing to watch - especially the 'banter' between presenters.

Within this category different colours were often used to distinguish between speakers but due to the persistent lags it was difficult to follow who was the speaker. Coder C consistently identified this as an issue:

Different colours are used [in Studio 10], but no other guidance is given, which makes it difficult to identify who is speaking.

Different coloured fonts are used [on Today], however the speakers are not clearly identified and at times the colours mix together.

Different font colours used [on ABC News Breakfast], but they intersect in confusing ways. No labels or titles to help viewers follow discussion between speakers

Commercial breaks were not typically captioned, and there were several instances where the cross to the commercial break meant that captions trailed off or were left unfinished. While commercials for big brands such as Telstra/NBN (viewed on SBS), Transperth, Maybelline, Lite N Easy, Officeworks, Make Smoking History, Lipton, Jenny Craig, Mazda (all viewed on Channel 7), RAC and BMW (viewed on Channel 9) were captioned, promotions for upcoming programs were not, suggesting that even though the channel would typically be required to caption the program when it did air, attracting an audience of viewers for the shows who were Deaf, deaf or have hearing loss was not on the broadcaster's agenda.

Spotlight on errors

***Sunrise* (7) – 5 March 2019 – Non-verbatim captions**

Despite being identified as one of the most accurate and easy to follow caption tracks, *Sunrise* also yielded the highest number of errors in this category, with 13 examples of non-verbatim captions identified by Coder B in the sample clip from the 5 March airing:

- Previous lines linger on screen as new text appears below it, which is really confusing and clearly doesn't follow the presenter. X 3
- There are so many typos and incorrect words in this section. X 2

- Captions reappear mid-sentence. X 2
- Captions disappear / no captions.
- Only one line of text appears in this whole section.
- Previous text stays on screen while new text appears.
- Incomplete paraphrasing x 2
- “Date or floor” [should be: a fatal flaw].

Breakfast television was considered problematic by all three coders because this genre tended to engage two or more speakers and moved at a fast pace. As such, while the coders agreed captions adequately reflected the intent of the content, they also agreed specific detail was often lost.

Regarding *Today* (9) for example, the coders agreed that captions moved too quickly, perhaps due to a persistent technical problem:

Technical issues with the captions are the issue. When the captions are on screen, despite mistakes, what is happening can be discerned. Overall, however, too much detail/information is lost.

Table 5: Overall findings against the tracking sheet – Breakfast / other programs

BROADCASTER	ABC		SBS		Channel 7		Channel 9		Channel 10	
PROGRAM	ABC News Breakfast		Al Jazeera News		Sunrise		Today		Studio 10	
DATE	27/2	6/3	27/2	6/3	26/2	5/3	26/2	3/3	26/2	5/3
Legibility										
Are caption fonts always legible?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are caption colours always legible?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are captions always three lines in length , or shorter?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are captions always on screen long enough to read? (i.e. no more than three words per second)	N	N	Y	Y	N	N	N	N	N	N
Are all on-screen text or visuals still adequately visible?	Y	Y	Y	N	N	N	N	N	Y	N
Speech										
Are all spoken words captioned? (i.e. no words missing)	N	N	N	N	N	N	N	N	N	N
Are captions always spelt correctly?	N	N	N	N	N	N	N	N	N	N
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?	N	N	N	N	N	N	N	Y	Y	Y
Are the captions always in sync with the corresponding speaker?	N	N	Y	Y	N	N	N	N	N	N
Non-speech										
Have sound effects and/or music not observable from the visual action been captioned?	Y	Y	Y	Y	Y	Y	N	Y	N	N
Overall										
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	N	N	N	N	N	N	N	N	N	N
Do the captions always adequately reflect the content ?	N	Y	N	N	Y	Y	Y	Y	N	Y
Overall, do you feel you could understand the program relying exclusively on the captions?	N	N	Y	Y	Y	Y	N	N	N	N
Overall comprehensibility (based on 4 criteria plus coders' judgement)	N	N	Y	Y	N	N	N	N	N	N

Commentary

Table 6 shows the overall coders' findings against the data collection tracking sheet for the category of commentary programs. The average number of errors across both weeks and the three coders was 23.

Results varied across the coders. While two coders felt the captions were too inaccurate to follow the programs, one believed the captions were still adequate. The persistent issues according to Coder C related to:

- The captions not being onscreen long enough ("Sometimes way too fast"; "You would need to really focus to keep up").
- Spelling mistakes ('Sydney was rarely good' instead of 'Sydney was really good.' Speedweek SBS 24 Feb 2019 17:48).
- Non-verbatim captioning ("Words are skipped when the captions lag behind").

When sound was added to the analysis, missing words that were not detected watching the program without sound were also noted by the coders.

- "Watching with the benefit of sound highlights just how much content is lost when relying on the captions."

Channel 7 performed well in this category, while 10, 9 and the ABC struggled. Of Q&A on the ABC Coder C noted lag in almost every category and suggested that while the program could be followed, it would take considerable effort on the part of the audience relying on captions; "you would need to really focus to keep up":

it can be frustrating to try and follow the conversation, especially when people are interjecting and interrupting each other. [...] A confusing experience overall, without sound.

Regarding *Weekend Today* on 9, Coder C believed:

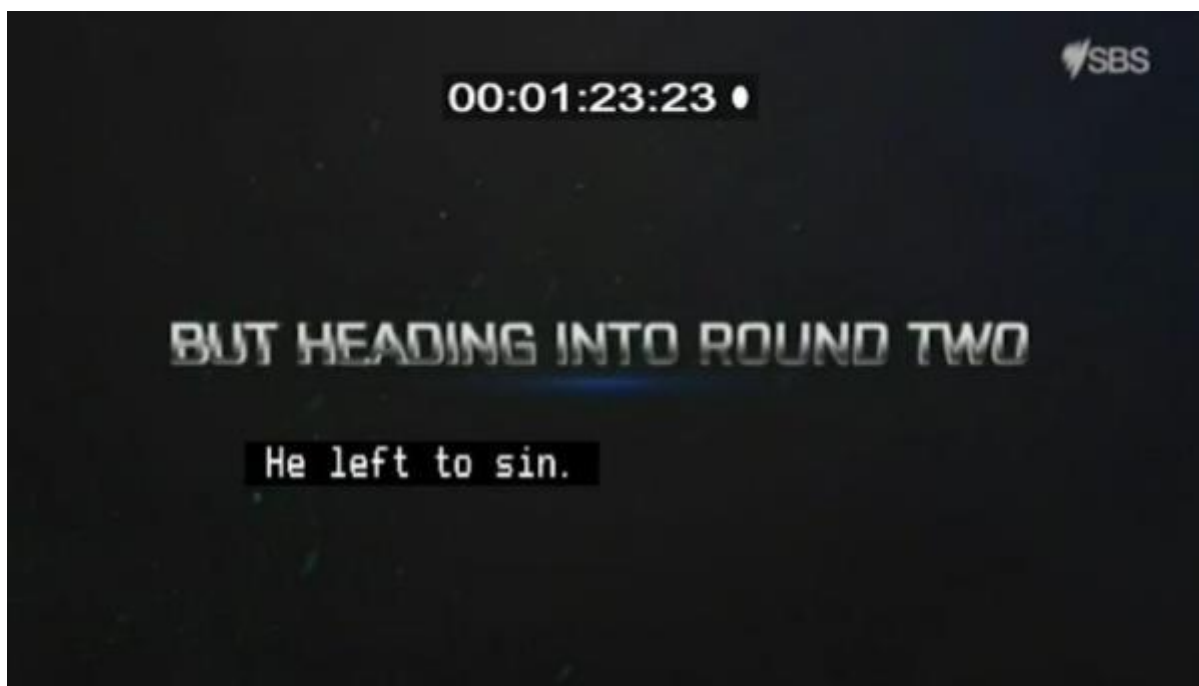
Due to lagging and omission of words, it is really difficult to get the gist of each segment. The overall topic is conveyed, but the specific details are lost.

The SBS program selected for analysis, *Speedweek*, was more specialised in nature and coders with more knowledge of motorsports struggled less; however, it was noted that the captions sometimes heavily abbreviated the audio. Given the fast-moving nature of the speech, this may have been a pragmatic move. As Coder C explains:

Lots of passing remarks and commentary missing, however you could argue this isn't such an issue in this program, due to the often self-explanatory nature of the commentary. E.g. "look at him go, he's doing it" is not essential for understanding what is happening."

Coder C felt the abbreviated captions obscured much of the *experience* of motorsport and suggested some of the atmosphere should have been captioned:

I would have liked to see more captioning of the sounds of the raceway, which are part of the overall experience of the cars, the atmosphere, and the racing.



Screenshot 6: Spelling mistake in *Speedweek* – 24 February 2019 ©SBS

While commercial breaks were not focused on throughout this project, it was noted that Channel 10 plays a significant number of commercials during *The Project*, but none of these were captioned. In the context of this project, this was noted as unique because brands identified as using captions in other programs and channels did not have captions during *The Project*.

Overall, this was quite a difficult category and most programs struggled with captions due to the nature of this genre where there are often multiple people speaking. For example, Coder C acknowledged the difficulty of captioning live 'when 5 or more people are speaking live in a group' and noted that overall the program became 'too confusing when the panellists interact'.

Spotlight on errors

***Speedweek* (SBS) – 24 February 2019 – Spelling errors**

- "His [he's] got this one"
- "What spare is a God" [spares they've got]
- "Put a shoe on [show on for] the fans"
- "When a bank [Willowbank] is one of our favourite tracks"
- "There were no bank [Willowbank] track here is fantastic"
- "He is damned therefore [down there] with Matt"
- "The result that the team once [wants]?"
- "His writing [riding] style"
- "Speed was down by about 15 plumbars [km/hr] and ..."

- “The committee [humidity] is up”
- “It is deputy [definitely] bigger”
- “244 plumbers [km/hr] and our....”



Screenshot 7: Poor quality captions in *The Project* (10) – 18 February 2019 ©Channel 10

Table 6: Overall findings against the tracking sheet – Commentary programs

BROADCASTER	ABC		SBS		Channel 7		Channel 9		Channel 10	
PROGRAM	Q&A		Speedweek		Weekend Sunrise		Weekend Today		The Project	
DATE	18/2	25/2	10/2	26/2	2/3	9/3	2/3	9/3	18/2	25/2
Legibility										
Are caption fonts always legible?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are caption colours always legible?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are captions always three lines in length , or shorter?	Y	N	Y	Y	Y	Y	Y	Y	N	Y
Are captions always on screen long enough to read? (i.e. no more than three words per second)	N	N	N	Y	Y	N	N	N	N	N
Are all on-screen text or visuals still adequately visible?	Y	N	N	N	N	N	N	N	N	N
Speech										
Are all spoken words captioned? (i.e. no words missing)	N	N	N	N	N	N	N	N	N	N
Are captions always spelt correctly?	N	N	N	N	N	N	N	N	N	N
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?	Y	Y	N	N	N	N	N	N	N	N
Are the captions always in sync with the corresponding speaker?	Y	N	N	N	N	N	N	N	N	N
Non-speech										
Have sound effects and/or music not observable from the visual action been captioned?	N	Y	N	N	N	N	N	N	N	N
Overall										
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	N	Y	N	N	N	N	N	N	N	N
Do the captions always adequately reflect the content ?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Overall, do you feel you could understand the program relying exclusively on the captions?	Y	N	Y	Y	Y	Y	N	Y	N	Y
Overall comprehensibility (based on 4 criteria plus coders' judgement)	Y	N	N	N	N	N	N	N	N	N

News

Table 7 (page 38) shows the overall coders' findings against the data collection tracking sheet for the category of news programs. The average number of errors across both weeks and the three coders was 15.5.

There was high correlation amongst the three coders for this category. In general, this category was considered to be relatively accurate and, on average, coders believed this category could be followed via the caption track alone. Nevertheless, there were some frustrations as noted by Coder C:

Viewing [ABC News] with sound makes it more obvious that the captions are cherry picking from the content, and do not include every spoken word or content snippet. You are getting a very stripped-down version.

[Channel 7 News] go too fast, you only get half the information and it's frustrating. I can pause this recording and go back, but viewers can't do that while watching live TV. [...] Sometimes there are clearly words missing, as the captions are static and people's mouths continue moving for a while. It leaves you wondering what you've missed out on and if it was important. [...] In some moments the captions are sufficient, but the times they go out of synch or become confusing are too numerous to make it a coherent experience overall. You could get the overall theme of topics covered, but the finer details are lost in translation.

You could understand some of [Channel 7 News], however the lag in captioning sometimes means images will not be explained until later (e.g. A story about toilet paper lags far behind the visuals at 26:00, leading to a confusing series of images without explanation until much later). So understanding would be inconsistent.

[On Channel 9 News] From around 2:30 captions skip repeatedly. 3:05 captions skipping – seems to be a technical issue with the captioning? They keep jumping jerkily for the rest of the show.[...] 2:26 various omissions lead to confusing captions. 2:35 missing words from quote. Captions stop for a bit at 6:44, "work has" just sits on the screen for a while. The word "shark" just floats menacingly on the screen for a while at 7:35.

A couple of times [on Channel 10 News] the captions clearly omitted information and spoken words, as the speaker on screen's mouth moved but there were no captions.

Without the benefit of sound [Channel 9 News] is very difficult to understand, especially as they move from one story to the next. The captions are often out of sync, missing key words, or simply skip what has been said.

Watching [Channel 10 News] with sound makes it clear how out of synch the captions are sometimes. Without sound it is much less obvious.

Some of the clips had sections where the captions would precede the audio content, perhaps because the clips or scripts were made available early. Interestingly, the SBS clip for *SBS World News* on 13 February included captions for content that appeared to have been cut out of the actual clip's audio. For example, Screenshots 8 and 9 include captioned content that does not appear in the program audio.



Screenshot 8: Captioned content not appearing in program audio in *SBS World News* – 10 February 2019 ©SBS



Screenshot 9: Captioned content not appearing in program audio in *SBS World News* – 10 February 2019 ©SBS

Commercials in this category were not captioned, except in a few cases. Intriguingly, however, channels/brands that had previously included captions in the other categories were not captioned here (e.g. Mazda).

Within this category, clearly distinguishing between individual speakers was more problematic than in other categories. Typically, different people are indicated via different

colours and there were instances in Channel 7 news (18/2/2019) and SBS News (10/2/2019) where the same colour captions were used for multiple speakers. Coder C explains:

As noted for previous 7 News program, the font colour will change, but you don't always know if the source of that colour is a newsreader, someone else, or someone on screen. [...]. Placing more detail or identifying info in brackets would help: e.g. [News reporter]: caption text. [Police commissioner]: caption text. [Doctor X]: caption text

While overall the news was considered understandable there were many examples of spelling errors and non-verbatim captions as illustrated in the screenshots below.

Spotlight on errors

Channel 9 News – 18 February 2019 – Spelling errors

- “freea.m. Do.” “Nine news periods” [Perth?]
- “In ‘9 the law”
- “scale of for enintelligence”
- “At \$1 a mirt milk tks sounds ...”
- “dar damage”
- home envagss”
- “*investigation rorgts a shot*”
- “244 plumbers [km/hr] and our....”



Screenshot 10: Captioning error in ABC News WA – 25 February 2019 ©ABC



Screenshot 11: Captioning error in ABC News WA – 25 February 2019 ©ABC

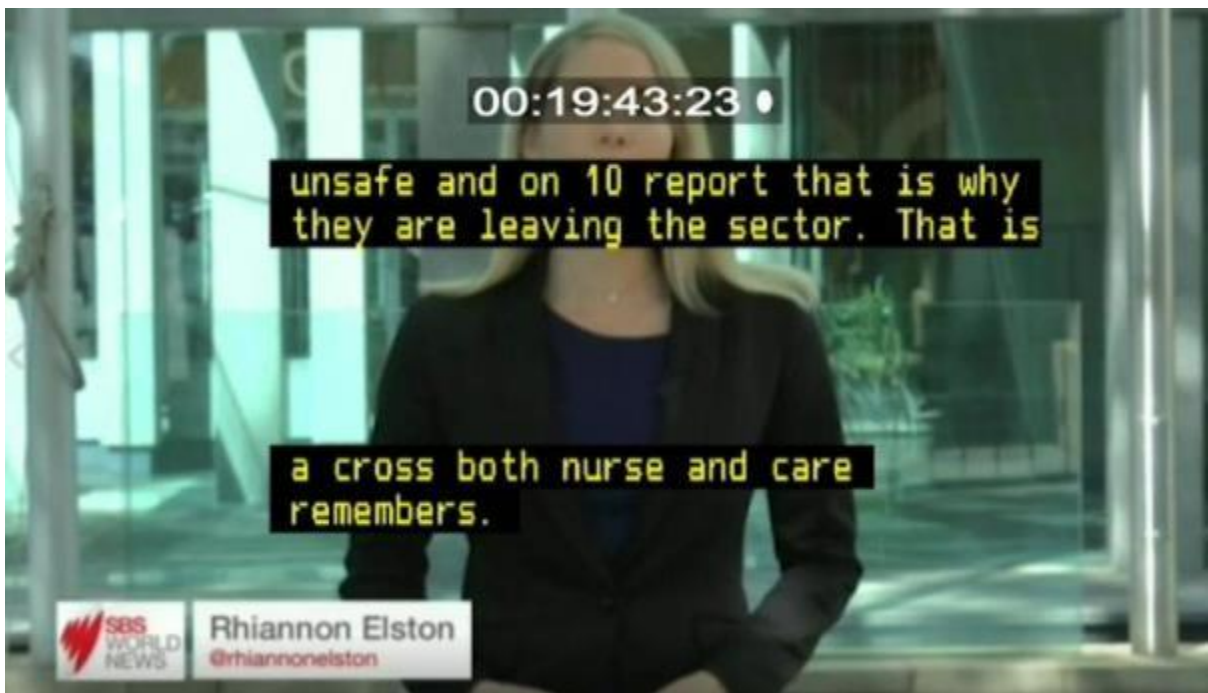


Screenshot 12: Captioning error in 9 News WA – 24 February 2019 ©Channel 9



Screenshot 13: Captioning error in *SBS World News* – 10 February 2019 ©SBS

There was also incidence of captions appearing at the top and bottom of the screen on *SBS World News*.



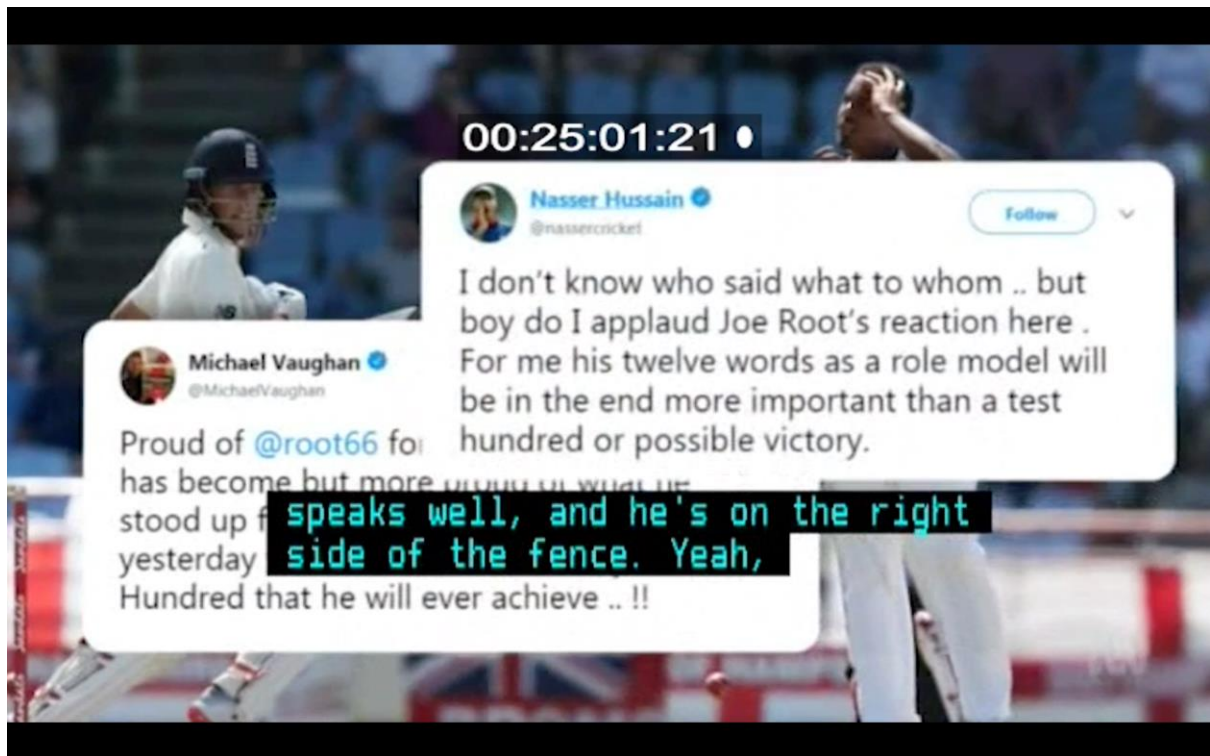
Screenshot 14: Captions appearing at top and bottom on the screen in *SBS World News* – 10 February 2019 ©SBS

Spotlight on errors

10 News WA (10) – 25 February 2019 – Does not clearly distinguish between presenters

Timecodes:

01:19	03:54	07:42	07:56	10:00
10:20	14:19	14:51	21:02	23:33



Screenshot 15: Captions obscuring onscreen graphics in ABC News WA – 25 February 2019 ©ABC



Screenshot 16: Abbreviated captions in 9 News WA – 18 February 2019 ©Channel 9

Table 7: Overall findings against the tracking sheet – News programs

BROADCASTER	ABC		SBS		Channel 7		Channel 9		Channel 10	
PROGRAM	ABC News WA		SBS World News		7 News WA		9 News WA		10 News WA 4pm	
DATE	13/2	18/2	10/2	13/2	18/2	25/2	18/2	25/2	18/2	25/2
Legibility										
Are caption fonts always legible?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are caption colours always legible?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are captions always three lines in length , or shorter?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are captions always on screen long enough to read? (i.e. no more than three words per second)	N	N	Y	Y	N	Y	N	N	Y	Y
Are all on-screen text or visuals still adequately visible?	N	N	N	N	N	N	N	N	N	N
Speech										
Are all spoken words captioned? (i.e. no words missing)	N	N	N	N	N	N	N	N	N	N
Are captions always spelt correctly?	Y	N	N	N	N	N	N	N	N	N
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?	N	N	N	N	N	N	N	N	N	Y
Are the captions always in sync with the corresponding speaker?	N	N	N	N	N	N	N	N	N	N
Non-speech										
Have sound effects and/or music not observable from the visual action been captioned?	Y	Y	Y	Y	Y	Y	N	Y	N	N
Overall										
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	N	N	N	N	N	N	N	N	N	N
Do the captions always adequately reflect the content ?	Y	Y	Y	N	Y	Y	Y	Y	N	Y
Overall, do you feel you could understand the program relying exclusively on the captions?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Overall comprehensibility (based on 4 criteria plus coders' judgement)	N	N	N	N	N	N	N	N	N	Y

Sport

This genre was unique in the context of this study because the audio offers additional but not necessarily essential context for the visual action onscreen. Sport can be viewed effectively without sound. Similarly, it is rare for broadcasters to offer sport on their primary digital channel, preferring to screen these on their digital multichannels (which are exempt from captioning regulation). While we were able to source sport screening on the ABC, SBS, 7 and 9, Channel 10 did not offer any sport programming on their main digital channel during the sample period.

Table 8 shows the overall coders' findings against the data collection tracking sheet for the category of sport programs. The average number of errors across both weeks and the three coders was 22.

There was some positive response to the captioning of this genre:

Excellent quality overall [on Big Bash Channel 7]. Really impressed by the captioning on this!

[Channel 9 Rugby] identify when the referee is talking, which is very useful [...] they [even] record the whistle blowing I wish all programs would do this.

Overall these are reasonable captions [on SBS Premier League], just a few confusing mixed words, misspellings, omissions

However, the need to capture the atmosphere was again identified:

It would have been nice to caption the sounds of the crowd [on ABC Golf], which are integral to this rather quiet game.

Captions would be better off placed higher on the screen [on Channel 9 Rugby]. They obscure peripheral action at times. [...] There are periods where the live commentary is simply not being captioned at all.

Re-watching the content with sound again highlighted "how much information is lost, how much commentary is omitted".

Captioning regulation only applies to the main digital channel – multichannels are exempt unless the program was previously aired on the primary channel. However, it was discovered that the A-League which airs on Channel 10 Bold did include captions, despite not being mandated to do so. Therefore the A-League was included in this study.

However, the A-League was identified by all three coders as one of the worst quality live captioning examples across the genres and broadcasters. Coder A expressed frustration at the overwhelming number of errors – "There were far too many errors to keep capturing. Really, really bad!". Coder C noted a different experience viewing with and without sound:

watching with sound is such a different experience, it makes you realise how much information has been left out of the captions.

Captions appeared at both the top and the bottom of the screen in the A-League screening (Screenshots 17-18) and a persistent glitch occurred where captions appeared to freeze.



Screenshot 17: Captions appear at the top and bottom of screen in A-League – 16 February 2019 ©10 Bold



Screenshot 18: Captions appear at the top and bottom of screen in A-League – 16 February 2019 ©10 Bold

Screenshots 19 to 34 illustrate a series of errors where the captions appeared to freeze.

















Aside from this outlier, sport was, in general, understandable and of a high quality. The errors tended to relate to spelling errors or non-verbatim captions.



Screenshot 35: Captioning errors in the Big Bash – 9 February 2019 ©Channel 7

Spotlight on errors

Rugby (9) – 21 March 2019 – Missing and Delayed Commentary

Coders observed that viewing with and without sound was a very different experience in this case.

- “[There is] significant lag, only really obvious when viewing [for a second time] with sound.”
- “There are periods where the live commentary is simply not being captioned at all – e.g. 25:49-26:03.”

Table 8: Overall findings against the tracking sheet – Sport programs

BROADCASTER	ABC		SBS		Channel 7		Channel 9		Channel 10	
PROGRAM	Women's Australian Open (Golf)		Premier League		Big Bash		Rugby		A-League	
DATE	14/2	17/2	10/3	17/3	9/2	15/2	14/3	21/3	16/2	23/2
Legibility										
Are caption fonts always legible?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are caption colours always legible?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are captions always three lines in length , or shorter?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Are captions always on screen long enough to read? (i.e. no more than three words per second)	N	Y	Y	Y	Y	Y	N	N	N	N
Are all on-screen text or visuals still adequately visible?	N	Y	Y	Y	Y	Y	Y	N	Y	Y
Speech										
Are all spoken words captioned? (i.e. no words missing)	N	N	N	N	N	N	N	N	N	N
Are captions always spelt correctly?	N	N	N	N	N	N	N	N	N	N
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?	Y	Y	Y	Y	N	Y	N	Y	N	N
Are the captions always in sync with the corresponding speaker?	N	Y	N	N	Y	Y	N	N	N	N
Non-speech										
Have sound effects and/or music not observable from the visual action been captioned?	N	Y	Y	Y	N	N	N	Y	N	Y
Overall										
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	N	N	N	N	N	N	N	N	N	N
Do the captions always adequately reflect the content ?	N	Y	N	Y	N	Y	Y	N	Y	Y
Overall, do you feel you could understand the program relying exclusively on the captions?	Y	Y	Y	Y	Y	Y	Y	N	N	N
Overall comprehensibility (based on 4 criteria plus coders' judgement)	N	Y	Y	Y	Y	Y	N	N	N	N

Conclusions

When this project set out to investigate the accuracy of live caption quality on free-to-air television, anecdotal evidence suggested caption quality was poor in certain circumstances, and that when caption quality was poor, consumers were unable to follow the program. The results not only confirmed this, they underlined that live caption quality was inconsistent across both the broadcasters and the programs themselves. As researchers we were unprepared for the sheer number of errors with coders noting up to 34 errors in a single subcategory. While captioning is regulated on 100% of content screened on free-to-air television between certain hours, specific standards regarding the quality of these captions, particularly when captioned live, are broad and difficult to enforce. As such, three research assistants were engaged to code the accuracy of live captions in this project to get a more accurate result.

Several of the criteria against which caption quality was measured in this study are qualitative in nature. For example, 'Are captions always on screen long enough to read?' is difficult to quantify and different coders made different assessments. Similarly, the more experience audiences have accessing captions, the faster they are able to read and digest them. Caption speed has increased significantly since captions were first introduced to television internationally in the 1970s. Likewise, expectations regarding verbatim captioning have changed, with audiences expecting captions that are verbatim rather than summarising or paraphrasing spoken content. Yet throughout this project it became apparent that some genres, particularly those with two or more speakers engaging in conversational commentary for example, did not offer strictly verbatim captions but would instead attempt to reflect the content in an abridged form. However, as the Standard suggests, the decision to reflect meaning rather than verbatim captions appeared to be made on the basis of pragmatism in a fast moving live broadcast environment as opposed to a consideration of the audience demographic. As such, while only two instances of censorship were identified in this project ("bitchy" was substituted with "annoying" on the Project on 18 February and the word "rubbish" was used in lieu of "bollocks, absolute bollocks" on *ABC News Breakfast* 27 February), this has been identified within the Deaf and deaf communities as unacceptable (Ellis & Kent, 2015).

Legibility:

- The legibility of captions tended to be good quality across the board, with the exception of the length of time captions appeared onscreen and the tendency to obscure onscreen graphics with captions.

Speech:

- Most of the errors were in the speech category.
- The errors in the speech category went across all four subcriteria – missing words, spelling errors, unclear distinction between speakers, and issues with sync.
- A lag of between 2 and 10 seconds occurred across the genres.

Non-speech:

- There were few errors in the non-speech category; however, music and sound effects were at times left out of the captioning track.

Overall:

- Significant nuance is lost when watching programs exclusively with captions which can make it difficult to follow programs.
- Captions were not always verbatim.
- The reassessment of programs with the audio turned on revealed significantly more errors.
- On average the genres with the most errors were commentary (23) and sport (22), followed by news (15.5) and breakfast (15). These numbers are significant given that only half an hour of the programs were assessed for this project.
- The coders believed sport and news programs were the easiest to understand via the captions track alone.
- The coders believed breakfast and commentary programs were the most difficult to understand via the captions track alone.
- The coders believed that Channel 7 tended to have higher quality live captions when compared to the other broadcasters.
- The coders believed that Channel 9 tended to have lower quality live captions when compared to the other broadcasters.
- There was some minor evidence of censoring.
- The commercial breaks were irregularly captioned.
- Any prior access to content – for example in the news and commentary genre – did not necessarily improve the quality of captions and in fact tended to introduce new errors such as captions preceding content or content that was not ultimately screened being captioned.
- While errors were consistently identified by the three individual coders, each

had a different view on un/acceptable captioning.

- The number of errors in a single subcategory varied between 0 and 34.

Recommendations

As a result of these findings we make the following recommendations:

Recommendation 1

The current project adopted a mixed qualitative and quantitative approach to the collection of data, based upon criteria provided by the ACMA's Television Captioning Quality Standard (the Standard). However, the Standard is by nature a qualitative measure. We recommend a review of the Standard to establish and quantify an acceptable number of errors given the demands of both live broadcasting and the needs of the audience.

Recommendation 2

Currently caption users wishing to make a complaint about poor quality live captions must complain to the broadcaster before lodging a complaint with the ACMA. Given that this project found that errors are quite common in live captioned programs, we recommend that the ACMA undertake monitoring of live captions. This would reduce the burden on consumers to make and follow up on complaints, and could help to ensure greater comprehensibility of live captioned programs for people who rely on captions.

Recommendation 3

Within live television, a certain degree of captioning error is to be expected; however, to understand what is and is not an acceptable level of errors and lag we recommend a second stage to this study where audiences who are Deaf, deaf and have hearing loss are invited to give their feedback regarding the quality of live captioning identified. This second phase study should be funded by the ACMA and should inform any review of the Standard.

Recommendation 4

Increasingly Australians are accessing free-to-air television via catch-up or so-called over-the-top television offerings. These, like the digital multichannels, are exempt from captioning regulations. We recommend a comparative study that first establishes whether captions are offered online and secondly compares their quality to live broadcast television.

Recommendation 5

While not a focus of this study, it was noted that only big brands offered captioned commercials and even these were inconsistent. Similarly, promotions for upcoming

programs were uncaptioned. We recommend analysis of the effectiveness of captioned advertising amongst both hearing and non-hearing audiences.

Recommendation 6

None of the programs coded in this analysis were of an emergency nature; however, given the plethora of errors identified, a dedicated analysis of live emergency broadcasts including audience responses is essential.

Recommendation 7

Significant advancements are being made in the area of artificial intelligence and machine learning as a tool to assist in the creation of accurate captions. There are also moves internationally to utilise machine learning as a way to address the delays often experienced in live captioning, despite community concerns about the use of Automatic Speech Recognition.⁵ With delays of between 2 and 10 seconds consistently identified throughout this project, we recommend the broadcasters investigate the potentials of artificial intelligence.

⁵ See for instance the World Federation of the Deaf and International Federation of Hard of Hearing People Joint Statement: Automatic Speech Recognition in Telephone Relay Services and in Captioning Services, available: <http://wfdeaf.org/news/resources/27-march-2019-wfd-ifhoh-joint-statement-automatic-speech-recognition-telephone-relay-services-captioning-services/>

Authors

Katie Ellis

Dr Katie Ellis is Associate Professor in Internet Studies and Director of the Centre for Culture and Technology at Curtin University. Her research is located at the intersection of media access and representation and engages with government, industry and community to ensure actual benefits for real people with disability. She has authored and edited 17 books and numerous articles on the topic of disability and the media, including most recently the monograph *Disability and Digital Television Cultures* (Routledge, 2019).

Kai-Ti Kao

Kai-Ti Kao is a Research Assistant with the Centre for Culture and Technology at Curtin University. Her research interests lie in social engagement with digital media, particularly in relation to power, representation and inequality. She has previously published on a range of these topics including policy framing of Information and Communication Technology for Development (ICT4D), digital engagement and mental health, and issues of representation in the popular videogame *Overwatch*. Her current research focuses on investigating the collaborative learning experiences for students with disabilities in higher education.

Gwyneth Peaty

Dr Gwyneth Peaty is a Lecturer in the Discipline of Internet Studies at Curtin University. Her research focuses on new media, popular culture and digital technologies, and she has published a range of journal articles and book chapters on these topics. She has conducted extensive research in the area of disability and digital media including a Curtin University funded Teaching Innovation project into the mainstream uses of captioned online lectures in higher education. Her current projects include a book on gargoyles and further explorations of captioning and audio description in entertainment and educational media.

Kathryn Locke

Kathryn Locke is a Researcher and PhD candidate at Curtin University. Kathryn has extensive research experience in researching issues related to disability and digital media and has been published in a range of disciplines, including sustainability and internet studies. Beyond her academic and research experience, Kathryn teaches externally for Curtin in the fields of internet studies, media and cultural studies.

Appendices

Appendix 1: Tracking sheet

Program title: _____

Broadcast channel: _____

Date program aired: _____

Date of viewing: _____

Researcher: _____

First viewing (no sound) / Second viewing (with sound) [Please circle]

	Yes	No	Note errors in this column with timestamp	Examples
Legibility				
Are caption fonts always legible?				
Are caption colours always legible?				
Are captions always three lines in length , or shorter?				
Are captions always on screen long enough to read? (i.e. no more than three words per second)				
Are all on-screen text or visuals still adequately visible?				
Speech				
Are all spoken words captioned? (i.e. no words missing)				
Are captions always spelt correctly?				
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?				
Are the captions always in sync with the corresponding speaker?				
Non-speech				
Have sound effects and/or music not observable from the visual action been captioned?				

	Yes	No	Note errors in this column with timestamp	Examples
Overall				
Are captions always verbatim ? (i.e. mark here any other errors not captured above)				
Do the captions always adequately reflect the content ?				
Overall, do you feel you could understand the program relying exclusively on the captions?				

Appendix 2: Quantitative Errors

Breakfast television Week 1

PROGRAM	ABC News breakfast 27/2			Al Jazerra 27/2			Sunrise 26/2			Today Show 26/2			Studio 10 26/2		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Legibility															
Are caption fonts always legible?															
Are caption colours always legible?															
Are captions always three lines in length , or shorter?															
Are captions always on screen long enough to read? (i.e. no more than three words per second)	9	5						1		no	2	2	2	no	
Are all on-screen text or visuals still adequately visible?							no		1	1					
Speech															
Are all spoken words captioned? (i.e. no words missing)	1	2	2	6			2		2	1	1	2	1		2
Are captions always spelt correctly?	4	7	2	5	2		11	8		2	7	2	5	5	2
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?	2	2			6		1	2	2	1		no			
Are the captions always in sync with the corresponding speaker?	no	no	2			no	no		2	1	no	no	no	1	no
Non-speech															
Have sound effects and/or music not observable from the visual action been captioned?						2			2						
Overall															
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	3	2	2		11		1	1	2		2	2	1	1	2
Do the captions always adequately reflect the content ?	4		2						2			N o	3		2
Overall, do you feel you could understand the program relying exclusively on the captions?	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	Y	N

Breakfast television Week 2

PROGRAM	ABC News breakfast 6/3			Al Jazerra 6/3			Sunrise 5/3			Today Show 26/2			Studio 10 5/3		
CODER	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Legibility															
Are caption fonts always legible?															
Are caption colours always legible?															
Are captions always three lines in length , or shorter?															
Are captions always on screen long enough to read? (i.e. no more than three words per second)	2	2	2					2		no	3	2	no	4	
Are all on-screen text or visuals still adequately visible?				1			no		1	2		2	2		
Speech															
Are all spoken words captioned? (i.e. no words missing)		2	2	2	1	1	6	10	2	3	11	2	3	1	2
Are captions always spelt correctly?	8	11		5	4		7	1		4			8	8	2
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?			2		2		2		2			2			2
Are the captions always in sync with the corresponding speaker?			no			no	2	6	2		no		no		no
Non-speech															
Have sound effects and/or music not observable from the visual action been captioned?			2						1	1		2			
Overall															
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	1	2	2	5	5	2		13	2	2	1	2	5	1	2
Do the captions always adequately reflect the content ?	1		2									2			2
Overall, do you feel you could understand the program relying exclusively on the captions?	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	Y	N

Commentary Week 1

BROADCASTER	ABC Q&A 18/2			SBS Speedweek 10/2			Channel 7 Weekend Sunrise 2/3			Channel 9 Weekend Today 2/3			Channel 10 The Project 18/2		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Legibility															
Are caption fonts always legible?															
Are caption colours always legible?															
Are captions always three lines in length , or shorter?													1	1	
Are captions always on screen long enough to read? (i.e. no more than three words per second)	14	6	2	1					2	9	2	2		3	2
Are all on-screen text or visuals still adequately visible?				3		1	1	18		1			1	7	
Speech															
Are all spoken words captioned? (i.e. no words missing)	6	4	2	3	8	2	1	11		2	2		5	13	
Are captions always spelt correctly?	4	9		5	8		7	19		6	13	2	9	5	
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?					1		1	7		1			1	6	2
Are the captions always in sync with the corresponding speaker?			2		3		5	1			2	2	1	1	2
Non-speech															
Have sound effects and/or music not observable from the visual action been captioned?	1		2	2		2	1		2	1		2			
Overall															
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	3	3		9	8		7	26			9	2	8	24	2
Do the captions always adequately reflect the content ?												2			
Overall, do you feel you could understand the program relying exclusively on the captions?	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Y	N

Commentary Week 2

BROADCASTER	ABC Q&A 25/2			SBS Speedweek 24/2			Channel 7 Weekend Sunrise 9/3			Channel 9 Weekend Today 93			Channel 10 The Project 25/2		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Legibility															
Are caption fonts always legible?															
Are caption colours always legible?															
Are captions always three lines in length , or shorter?		no													
Are captions always on screen long enough to read? (i.e. no more than three words per second)	13	no	no					1	2	7	2	2	1	4	
Are all on-screen text or visuals still adequately visible?	2			7		2	2	4		1			3	3	
Speech															
Are all spoken words captioned? (i.e. no words missing)	1	9	2	18	2	2	1	2	1	1	3	2	3	5	2
Are captions always spelt correctly?	7	9		23	18	3	11	4		5	8		3	3	2
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?				4	1			4		2			1	2	2
Are the captions always in sync with the corresponding speaker?	no		no	8			7	9		2		no	no		no
Non-speech															
Have sound effects and/or music not observable from the visual action been captioned?			2	1		2	2		2	1			1		
Overall															
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	8		2	6	27	2	6	34		3	6		2	2	2
Do the captions always adequately reflect the content ?			2												2
Overall, do you feel you could understand the program relying exclusively on the captions?	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N

News Week 1

BROADCASTER	ABC News 18/2			SBS News 10/2			Channel 7 News 18/2			Channel 9 News 18/2			Channel 10 News 18/2		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Legibility															
Are caption fonts always legible?															
Are caption colours always legible?															
Are captions always three lines in length , or shorter?															
Are captions always on screen long enough to read? (i.e. no more than three words per second)	4	3	2					3	2	4	2	2			
Are all on-screen text or visuals still adequately visible?	1	1						1	1	1	3			3	3
Speech															
Are all spoken words captioned? (i.e. no words missing)	1	1	1	1	4	2	3	1	2	2		4	5	6	2
Are captions always spelt correctly?				1		2	2			10	15	3	6	5	2
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?	1	18			2	2		18	2	3	2	2	2	8	
Are the captions always in sync with the corresponding speaker?	5	5	2	3	1			5	3	1				2	2
Non-speech															
Have sound effects and/or music not observable from the visual action been captioned?			2						2		1	2	1	1	
Overall															
Are captions always verbatim ? (i.e. mark here any other errors not captured above)		12		3	11		3	12		1	1		4	16	
Do the captions always adequately reflect the content ?												2	2		
Overall, do you feel you could understand the program relying exclusively on the captions?	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y	Y

News Week 2

BROADCASTER	ABC News 25/2			SBS News 13/2			Channel 7 News 25/2			Channel 9 News 25/2			Channel 10 News 25/2		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Legibility															
Are caption fonts always legible?												1			
Are caption colours always legible?															
Are captions always three lines in length , or shorter?						1									
Are captions always on screen long enough to read? (i.e. no more than three words per second)	5	4	2							3	3	2			
Are all on-screen text or visuals still adequately visible?	3	1	1	1	1		1		2	2	1	1	3	3	
Speech															
Are all spoken words captioned? (i.e. no words missing)	1	5	2	1	3		2	3	2	2	2	2	4	5	1
Are captions always spelt correctly?	4	8	6	5	6			1		5	12	7	2	8	2
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?	1	10			1			24	2	1		1			
Are the captions always in sync with the corresponding speaker?	lag		no	2	1	no		1	2			1	3	2	no
Non-speech															
Have sound effects and/or music not observable from the visual action been captioned?			2			2							1		2
Overall															
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	1	7		1	11		1	17	2	3	2		2	8	
Do the captions always adequately reflect the content ?				5								1			
Overall, do you feel you could understand the program relying exclusively on the captions?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y

Sport Week 1

BROADCASTER	ABC Golf 14/2			SBS Premier League 10/3			Channel 7 Big Bash 9/2			Channel 9 Rugby 14/3			Channel 10 A-League 16/2		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Legibility															
Are caption fonts always legible?															
Are caption colours always legible?															
Are captions always three lines in length , or shorter?															
Are captions always on screen long enough to read? (i.e. no more than three words per second)	1	no								1	4		4		2
Are all on-screen text or visuals still adequately visible?	5					2									
Speech															
Are all spoken words captioned? (i.e. no words missing)	9	no	no	4	5	2	8			2	8	1	3		2
Are captions always spelt correctly?	7	7		5	19	2	8	10		1	5		14	12	2
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?							2	no		2				2	2
Are the captions always in sync with the corresponding speaker?	1	1		1	5					9	11		8	25	
Non-speech															
Have sound effects and/or music not observable from the visual action been captioned?	1		2			2		no		1				9	
Overall															
Are captions always verbatim ? (i.e. mark here any other errors not captured above)		16		1	15	1	5	18			11		21	6	
Do the captions always adequately reflect the content ?	1			1		1	7								
Overall, do you feel you could understand the program relying exclusively on the captions?	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N

Sport Week 2

BROADCASTER	ABC Golf 17/2			SBS Premier League 17/3			Channel 7 Big Bash 16/2			Channel 9 Rugby 21/3			Channel 10 A-League 23/2		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Legibility															
Are caption fonts always legible?															
Are caption colours always legible?															
Are captions always three lines in length , or shorter?															
Are captions always on screen long enough to read? (i.e. no more than three words per second)										6	11	2	2		
Are all on-screen text or visuals still adequately visible?	3		2			1				no		2			
Speech															
Are all spoken words captioned? (i.e. no words missing)	2	5	1	3	1	1	6	no	1	3	20		12		no
Are captions always spelt correctly?	6	22	2	7	5	1	1	3		1	4		11	8	
Do captions always clearly identify and distinguish individual speakers, including on-screen and off-camera voices?	3						1						1		
Are the captions always in sync with the corresponding speaker?				2	11		no			8		1	no	25	
Non-speech															
Have sound effects and/or music not observable from the visual action been captioned?						2	no	no				2			1
Overall															
Are captions always verbatim ? (i.e. mark here any other errors not captured above)	4	13			4	2		6		3			11	9	2
Do the captions always adequately reflect the content ?	2									1		2			1
Overall, do you feel you could understand the program relying exclusively on the captions?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Y	N

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