Whitepaper

Trends and Report of Utilization Data

as a De Facto Accessibility Service

for the Japanese Film Market

2020 - 2024

HELLO! MOVIE

October 2024

Hear Deeper.
耳をすまそう。

1. Barrier-free Environments Required in the Film Industry of Japan

Since the Act for Eliminating Discrimination against Persons with Disabilities came into effect in 2016 followed by the Act on the Promotion of Measures for Improving Information Accessibility, Use, and Communication for Persons with Disabilities, which took effect in 2022, public and commercial facilities have been facing a growing need to make their information environments more barrier-free for persons with disabilities who use them. In particular, in light of the amended Act for Eliminating Discrimination against Persons with Disabilities, which came into effect in April 2024, the film industry needed to reach a consensus on a comprehensive service solution that can be adopted nationwide across all films, theatrical productions, etc., and implement the solution. This process had to meet the two distinct requirements of *reasonable accommodation* and entertainment value.

1.1 What is a Reasonable Accommodation?

According to the Convention on the Rights of Persons with Disabilities, a *reasonable accommodation* means "necessary and appropriate modification and adjustments not imposing a disproportionate or undue burden, where needed in a particular case, to ensure to persons with disabilities the enjoyment or exercise on an equal basis with others of all human rights and fundamental freedoms."

1.2 Prerequisites for Implementation of Service Solutions

A *reasonable accommodation* must be considered not only at actual service sites catering to persons with disabilities but also during the production, development, and preparation phases in order to ensure sustainable operation and effective cost control. To implement a highly scalable barrier-free design for the viewing of films, theatrical productions, etc., the experience must be delivered using a post-production, supplementary service method that is entirely separate from the films and performing arts programs. The method must also be deployed with the prior consent of the producers to avoid compromising their artistic intentions and envisioned entertainment value. In the film industry, there has been a viewing option that provides audio and caption guides synced with the visual and auditory content as it unfolds. Therefore, the realistic approach has been to devise a method that can widely distribute and provide a guide function without hindering the production process.

1.3 Business Requirements Revealed by Reasonable Accommodation

Since movie theaters and theaters are where the service is offered, the ideal method would allow both able-bodied and disabled people to simultaneously enjoy the same content in the same space once the programs are released to the public, regardless of time or facility. However, it is difficult to accurately predict the number of people with disabilities who will come to each showing and require the guide service. As producers decide at their discretion whether to create and offer a guide service to accompany their films and performing arts programs, the guide method must allow the scale of the service to be adjusted after its actual introduction and operation. In view of these business requirements, HELLO! MOVIE set out to identify the technological requirements of an app that would be used by persons with disabilities on their smartphones, which are widely used, assuming that they will bring their own devices to the event venues and operate the guide app themselves. HELLO! MOVIE identified the following

basic requirements for the app:
- can work on widely used smart devices;
- can work with the existing equipment and environment available at any movie theaters and theaters nationwide;
- is easy to use;
- can function on devices in airplane mode with all telecommunication functions disabled; and
- the guide function can only be used in movie theaters and theaters.

HELLO! MOVIE decided to limit the use to earphones for the audio guide and smart glasses for the caption guide so that sound leakage and light leakage from the devices would not affect other audience members sitting nearby (Figure 1).

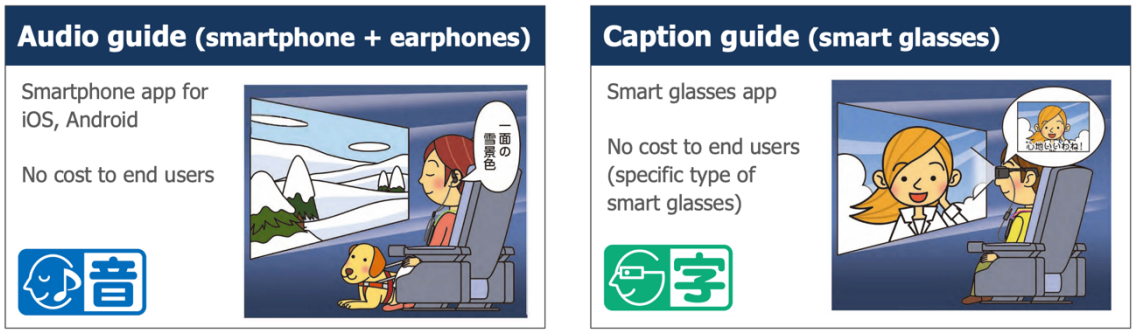


Figure 1: Pictogram on "an audio guide that can be heard through a smartphone" and "a caption guide that can be viewed through glasses" in movie theaters

2. Content Technology of Audio Synchronization System

The audio synchronization system combines the elemental technologies developed by HELLO! MOVIE, which are called *audio fingerprints*[1)] and *audio watermarks*[2)], and which are related to acoustic signal processing. The method controls the users' and audience-space devices in sync with the program as it progresses, which is determined by the audio data as the content unfolds. This syncing function is achieved by collating the time data of the unfolding scene with the time data of the audio and visual guide program without communicating with any external server, etc.

2.1 HELLO! MOVIE app for Users

To meet the business and technological requirements, HELLO! MOVIE devised a method called HELLO! MOVIE, which is equipped with the audio synchronization system. The method can be deployed simply by installing and using a special app called HELLO! MOVIE (https://hellomovie.info/) on the users' devices, to which audio and caption guide data created in advance is securely distributed over the internet. HELLO! MOVIE is publicly available and can be downloaded at any time for free, and works on iOS, Android, and smart glasses. The app also has an operability check function that can be used on the way to a movie theater, along with a search function to find out which films are currently screening barrier-free. If the app detects the audio data of a film being screened in a movie theater, which is unavailable elsewhere, the guide function is activated only for those users who have purchased tickets (Figure 2).

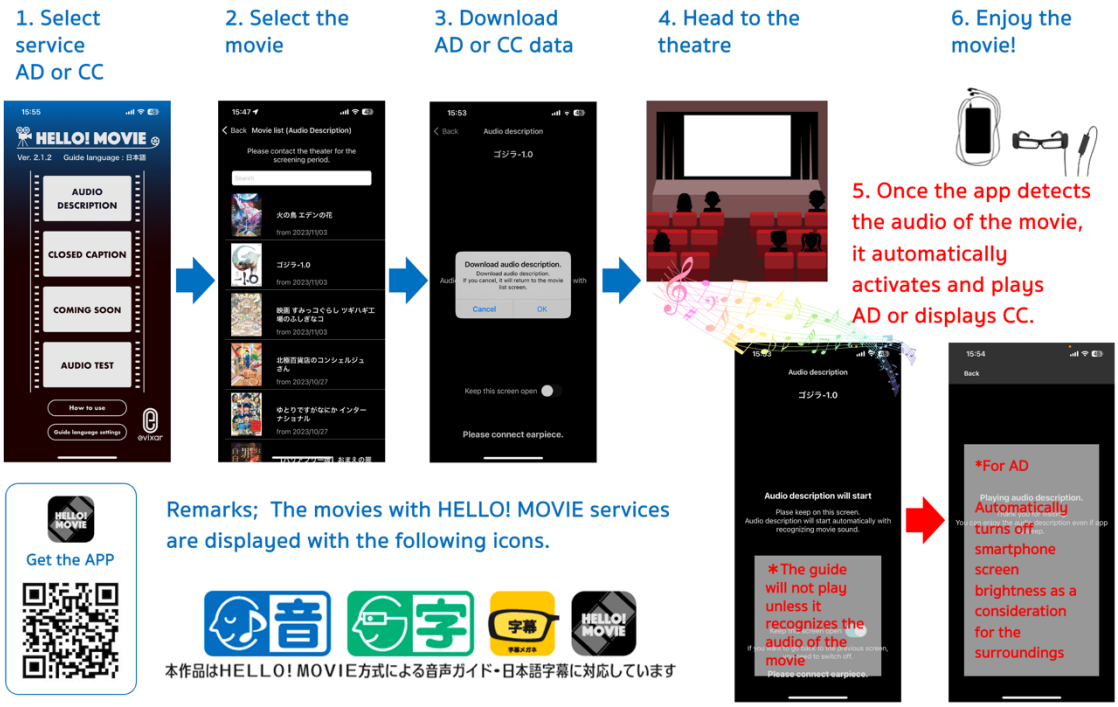


Figure 2: Service Flow of HELLO! MOVIE

- **HELLO! MOVIE and Evixar's proprietary audio sync system:** The combination of two technologies in this system – audio fingerprints and audio watermarks – **enables high-precision syncing from the start of a movie**, which involves embedding audio watermarks in the movie opening where there may be no sound.
  - **Patents registered related to syncing techniques** (Patent no. PCT/JP2016/081900)
- System requirements in movie theaters: No additional equipment needs to be installed. The system can be used in airplane mode (suspension of telecommunication functions) (guide data is downloaded to smartphones in advance).
- Guide function requirements: The system recognizes the audio data of the movie being played and syncs automatically (simple system operation and easy operability on smartphones). The system cannot be used if there is no recognizable movie audio being played (use limited to movie theaters).
- Smartphone/AR glasses app requirements: No screen light leakage. The guide function cannot be used unless earphones are worn (*reasonable accommodation* for the able-bodied).
- Movie production requirements: Audio and caption guide data must be produced and provided, which are entirely separate from the video and audio contents of each movie (which affects movie production schedule, budget, etc.).

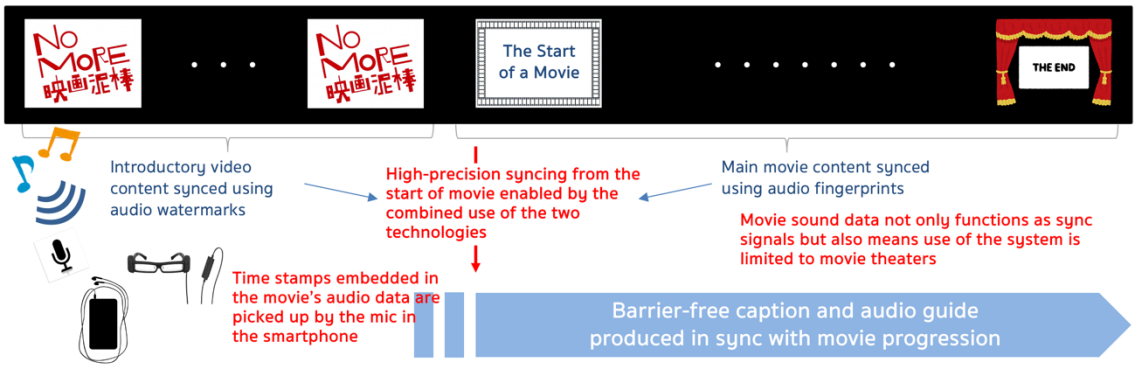


Figure 3: Mechanism of the Audio Synchronization System

Furthermore, to meet production and operational requirements, audio watermarking is used to sync with the video content that is played before each film starts, while audio fingerprints are used for syncing with the main film content. These two distinct sync techniques have two objectives: to start the syncing immediately after the main film starts, and to completely separate the main film production from the audio and caption guide production employing the method (Figure 3).

To provide audio and caption guides immediately after a film is released, these guides need to be prepared in parallel with production of the main film, which requires this complete production separation.

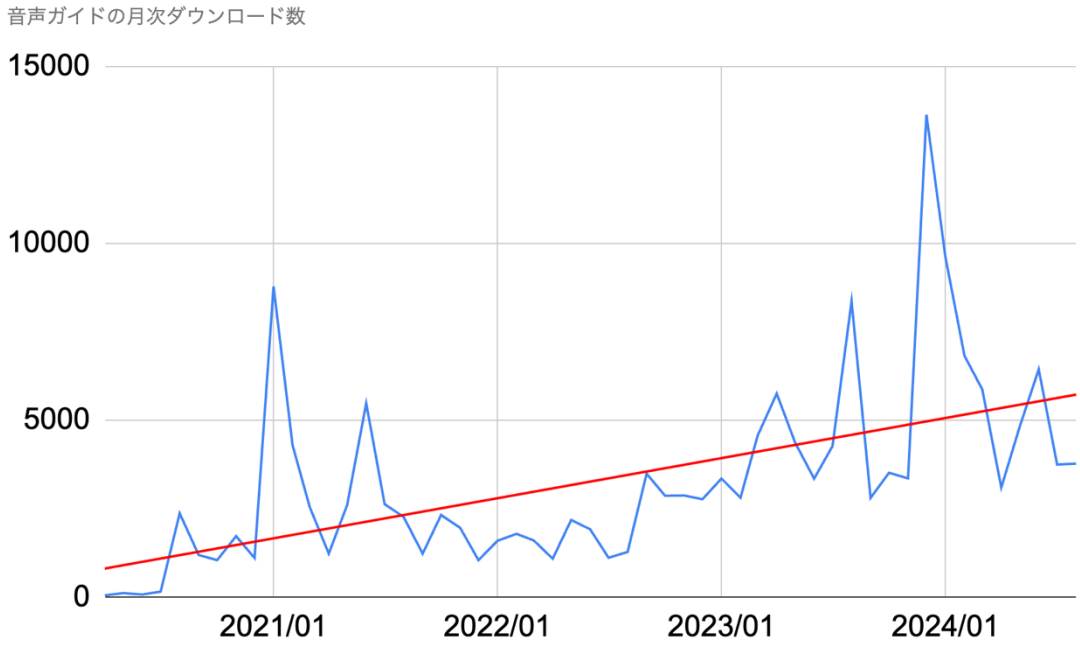
2.2 Industry Standard

For persons with disabilities, being able to watch the latest box-office hits alongside able-bodied fellow movie-goers is a novel value proposition for their entertainment experience. The method enables the barrier-free screening of films from the first day of their release in any movie theater and in any seating position, through the guide data playback function of the app installed on smart devices, which are also commonly used by persons with disabilities. As for smart glasses, which are not as widely used as smartphones, HELLO! MOVIE offers a service whereby caption glasses can be rented at service counters in movie theaters.

The key advantage of the method is the ability to deliver the guide function as a post-production, supplementary service, by harnessing the audio synchronization system, without imposing any new burden on the conventional production flow or requiring any additional investment in facilities and equipment. HELLO! MOVIE was adopted for 32 out of the 34 Japanese films that were released in 2023 and achieved ticket sales of over one billion yen, and

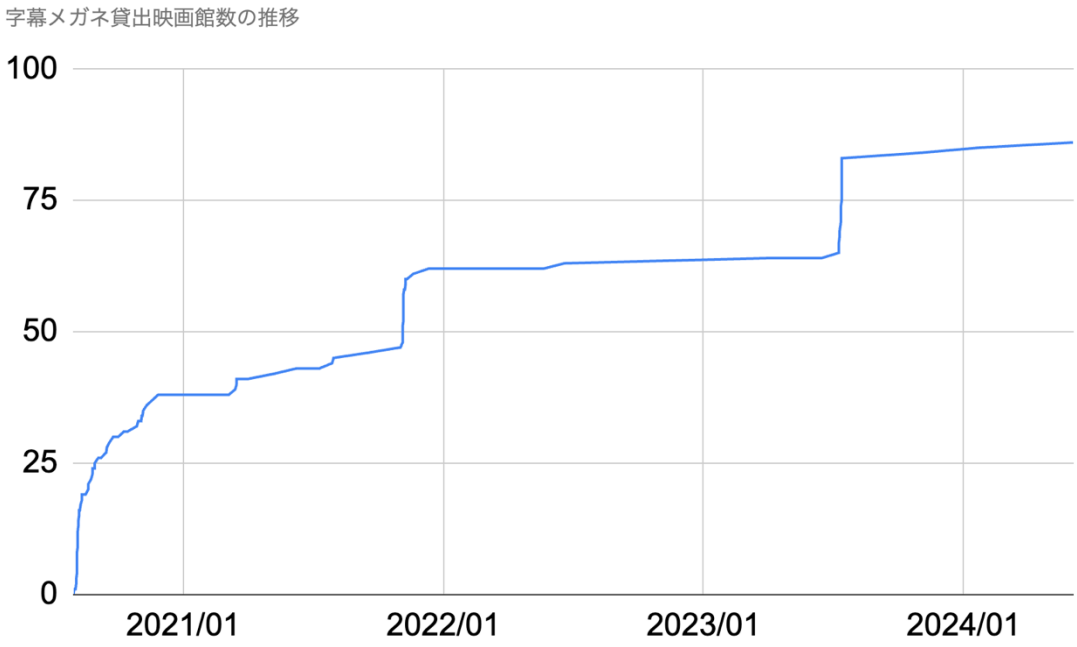
it has been introduced by Hollywood-based film studios in the U.S. since 2024. As of September 30, 2024, the guide data for barrier-free purposes had been downloaded 180,000 times through the HELLO! MOVIE app, while the caption glasses had been rented over 30,000 times, thus the method has become established as a crucial component integral to the industry's standard infrastructure.

Graph 1 shows the changes in the number of downloads of the audio guide for barrier-free purposes. As the initiatives become more widely recognized and as more films are screened barrier-free, the number of downloads is increasing.



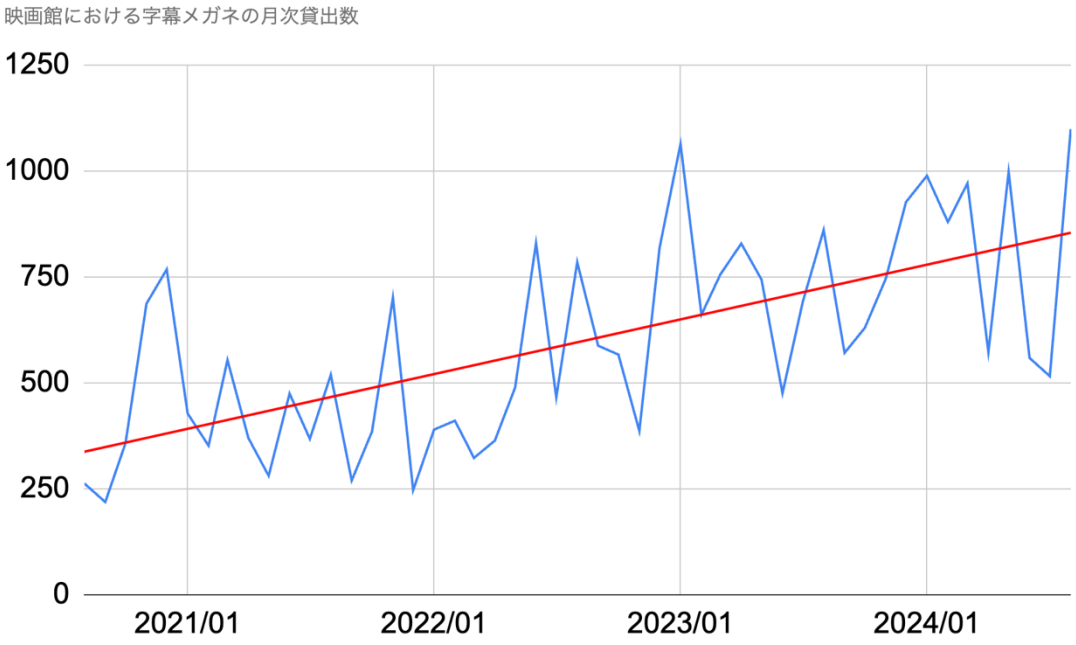
Graph 1: Monthly Changes in the Number of Downloads of the Audio Guide (Red bar: Trend line)

Graph 2 shows the changes in the number of movie theaters that offer a caption glasses rental service. This service is available in 88 movie theaters across Japan as of September 30, 2024. The number has been on the rise, mostly in major movie theater chains, since the second half of 2023 when COVID-19 infections finally subsided.
The number also spiked when a new model of AR smart glasses with improved performance was launched and when the hardware of AR smart glasses was donated by a support group to the industry.



Graph 2: Changes in the Number of Movie Theaters that offer a Caption Glasses Rental Service

Graph 3 shows the monthly changes in the number of caption glasses rented in movie theaters. Higher quality AR smart glasses will be sold by companies at prices that are reasonable even for individuals as a global trend, which is likely to boost the use of the caption guide.



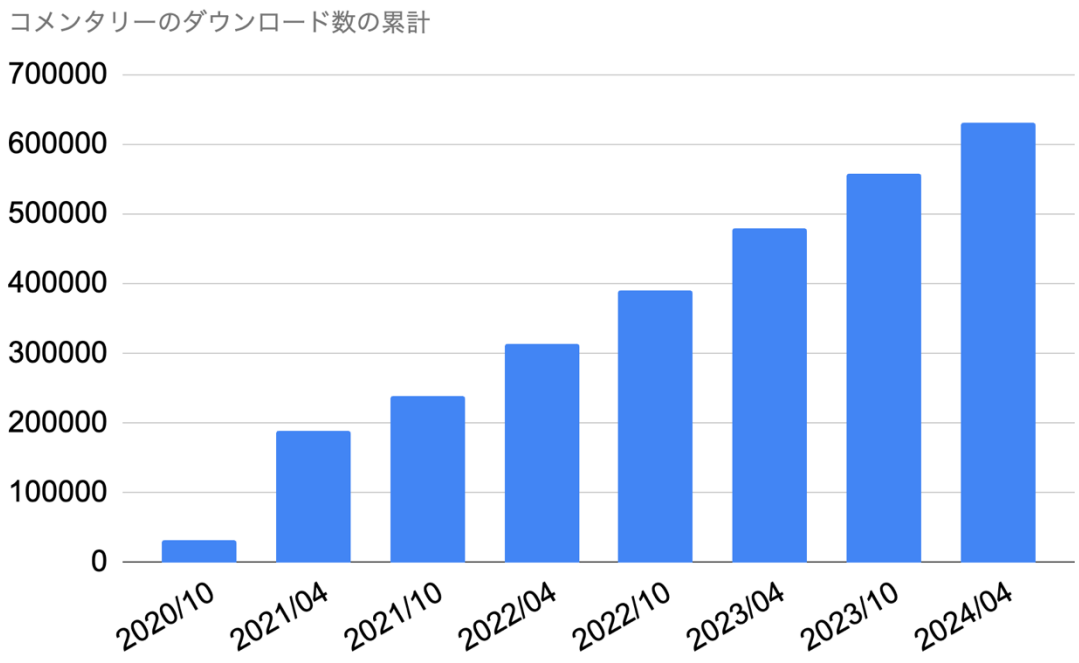
Graph 3: Monthly Changes in the Number of Caption Glasses Rented in Movie Theaters (Red bar: Trend line)

2.3 Aging Population and Needs for Barrier-free Film Screening

According to the 2022 Annual Report on the Aging Society issued by the Government of Japan, it is estimated that population aging will sharply increase over the next forty years: the percentage of individuals aged 65 years and older among the country's entire population was only 5.1% in 1950 but rose to 9.3% in 2020 and is projected to jump to 17.8% in 2060. As the country's population ages, the number of persons with visual and auditory disabilities is likely to rise, driving the need for barrier-free film screening.

3. New User Experience Generated and Business Needs Revealed by Barrier-free Film Screening

The method is not limited to persons with disabilities and can also provide additional services completely separate from main film production, thus highlighting new business needs in movie theaters. This is because new content is released earlier in movie theaters than in entertainment for the home, and also because the post-COVID-19 business environment requires added value for user experiences available only in movie theaters. Based on the method, this service is now expanding to provide audio and other commentary services exclusively for app users to encourage people to visit movie theaters repeatedly; to link with penlight (acoustic-linked light stick) performances at cheering screenings, where the audience can cheer while watching a film like a live concert; and to provide multilingual guides to encourage the consumption of experiences by foreigners visiting and staying in Japan.



Graph 4: Total Number of Uses of Audio and other Commentary Services available exclusively to app users to Encourage People to Visit Movie Theaters Repeatedly

As shown in Graph 4, guide services, including those for barrier-free purposes and others, have been adopted for 50 films and used over 650,000 times, boosting ticket sales.
This is a successful example of digital transformation (DX), where persons with disabilities

become early adopters (early customers) and stimulate the entire industry. HELLO! MOVIE will step up its business development efforts by proposing solutions to Hollywood-based film studios in the U.S. and other entertainment event promoters around the world, building on its successes in Japan as described in this report and leveraging its registered international patents on the audio synchronization system.

Providing audio and caption guides triggered by content sounds, the method has been applied to not only movie theaters but also various locations and situations, such as planetariums, libraries, factory tours, and video footage.

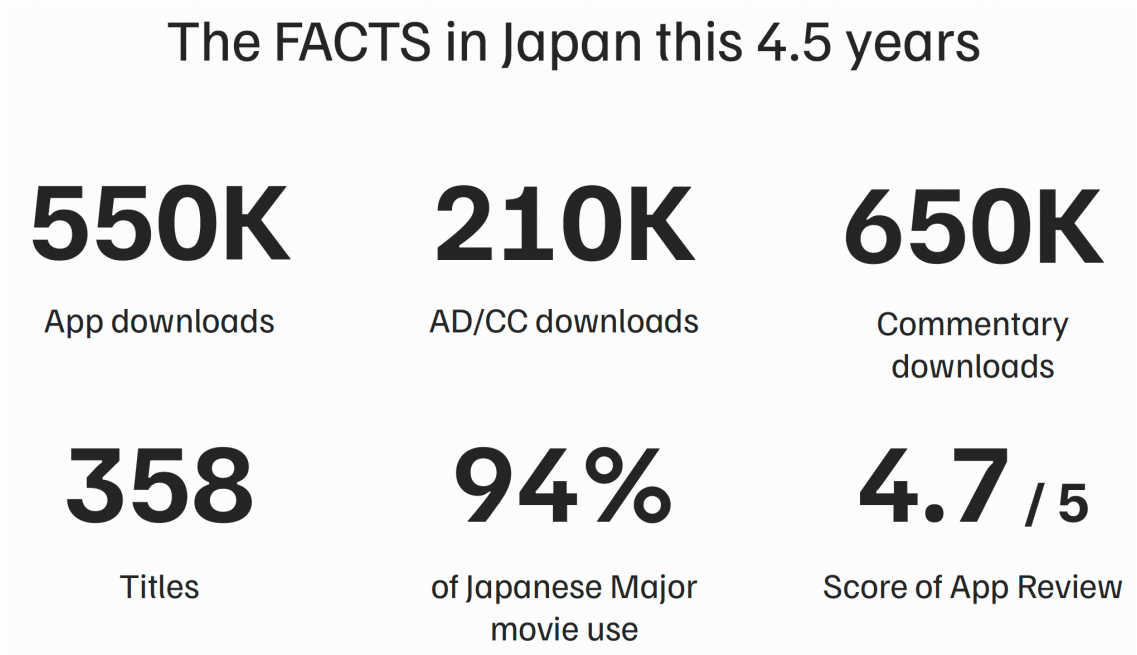


Figure 4: Highlight of Utilization Data

4. Postscript

The initiatives described in this report have contributed to innovations that support and enhance audio and visual assistance services, such as barrier-free film screenings and performing arts exhibitions, based on the spread of smartphones.

Amid the rapid progress of various ICT technologies and AI, there remains the challenge of not leaving anyone behind; diverse values present people with multi-layered challenges. The insights gained when facing fundamental human and social issues change over time, and so it is important to utilize even small successes as a new, enormous strength by evoking sympathy for them. A commercialization approach that involves making careful preparations to solve social issues and using unpredicted contingencies while exploring elemental technologies in response to demand is called “deep tech” and will become increasingly important.

Notes

1) Audio fingerprinting is an elemental technology that operates on *teacher* data comprising signal-processed and encoded features of predetermined target sounds, and matches them to the encoded external sounds that are acquired through the devices' microphones, etc., to determine their identicality. One of the advantages of this technology is that it cannot be misused in violation of privacy or copyright, as it does not track the film or performing arts contents, and the data, once encoded, can no longer be decoded, making it easier to obtain permission from film producers and production companies when negotiating the terms of their business use. HELLO! MOVIE's proprietary algorithm has been developed mainly for delivering the guide function through smartphones and smart glasses and is highly robust. Its key features include the ability to detect audio signals that are emitted from loudspeakers, transmitted through the air, and captured by devices' microphones.

2) Audio watermarking is HELLO! MOVIE's elemental technology for embedding text data, etc. that have been converted from encrypted audio signals. HELLO! MOVIE's proprietary algorithm provides superb media durability, secrecy protection, reverberation, and noise resistance, and delivers proven resistance to deterioration in sound quality. Hence, it can successfully decode audio signals that have been emitted by loudspeakers, transmitted through the air, and captured by devices' microphones. This, for example, enables broadcast-type communication between the loudspeakers that already exist at entertainment facilities and the audience-space microphones, even in environments where there is no radio wave or wireless communication technology.