



The Piksel Whitepapers
How metadata unlocks
the future of content discovery

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This White Paper outlines dramatic advances in content discovery, search and recommendation that will improve the business prospects for service providers, broadcasters and other content owners. It explains the revolution in metadata technology and processes that underpin these advances. It demonstrates clearly how an advanced content metadata system improves the user experience and helps to drive loyalty, differentiation and revenues for both broadcast and digital services.

HOW METADATA UNLOCKS THE FUTURE OF CONTENT DISCOVERY

INTRODUCTION

There is more premium video content than ever, available to watch anytime, anywhere. Responding to increased competition, Pay TV operators have built enormous on-demand catalogues. Broadcasters are expanding their online services with more library content and short-form video. And we still have hundreds of channels of linear TV.

Increasingly, the key to success for service providers, broadcasters and channel owners is to help viewers navigate through this sea of content so they can quickly find the television they love, and then more of it. Media companies must provide the tools to explore every corner of their expanding content universes, ensuring a compelling user experience.

Better content discovery is not a luxury; it is a must-have. One-third of consumers responding to a September 2015 Cord Cutting Survey conducted for Rovi [1] said they frequently find nothing to watch, and 7% said they turn off their TVs or devices “every time” because they cannot find anything worth watching.

73% of users are extremely or somewhat frustrated when they cannot locate enjoyable content, according to the survey, which covered 4,000 Pay TV and OTT subscribers across seven markets. Two-thirds of all respondents said they would be likely to extend their contract, upgrade their service or sign up with a provider if they offered better search or recommendations.

Improving content discovery leads to higher audience engagement and user satisfaction - and so customer retention and improved monetisation.

Content discovery itself is undergoing a generational upgrade, which in turn is underpinned by a revolution in metadata technology and processes. In future, content catalogues will be better managed, content descriptions will be more accurate and valuable, search will be far more granular and recommendations more useful. The impact will be to make TV more personal than ever without sacrificing the serendipity that entertainment lovers value.

“**73%** of users are extremely or somewhat frustrated when they cannot locate enjoyable content”



WHAT HAPPENS WHEN YOU TURBO-CHARGE METADATA

In a world where easy access to content everywhere is paramount, bad metadata and metadata management damages media businesses. Even average metadata processes can be a burden on resources and a drag on innovation.

A common problem is when the same piece of content is ingested multiple times, each time with its own accompanying metadata. Viewers can be presented with multiple versions of the same movie or programme, categorised differently, with different descriptions upon which viewers must make their judgements.

Good metadata processes introduce consistency in how content is presented and described, improve the accuracy of the information about content, and can enrich descriptions with bigger 'cast and crew' lists and critics' ratings. These improvements increase user confidence and engagement.

Whereas service providers and content owners want to blur the boundaries between television and multiscreen, inferior content management can lead to stark inconsistencies in what you see on different devices. Someone can search for James Bond films and be presented with two on a set-top box and four completely different titles on a laptop.

Converging set-top box (broadcast) and OTT (digital) workflows eliminates function duplication and reduces operational costs. A single, master metadata file contains the different length synopses and the lower and higher resolution images that are needed to present content on different screen types.

The creation of a single metadata file for each available programme means viewers are no longer presented with different versions of a programme during search or recommendation, one of which could be geo-blocked, another only cleared for linear



viewing and a third only available for catch-up viewing. They instead see one version of the content, which links them to the video file that is correct for their circumstances (rights, device, location, language, etc.).

Sometimes there is nothing obviously wrong with the metadata – until you see what rivals are trying to achieve. Searching content under the 'thriller' category is fairly standard but limiting. Recommendations based on collaborative filtering suffer from 'cold start' and those based on genre may be too broad.

Broadcasters and distributors can start to create new, unique metadata to improve discovery. Scene analysis, using visual identification, and natural language processing of closed captions, deliver insights about who is present, what they are doing and feeling, and what they are talking about. Content can be better themed according to metrics like mood and plot. Search is made easier with micro-genres such as 'quirky thriller'. Plot types can be used to drive recommendations.

METADATA CONSOLIDATION: WHAT IT IS AND WHY IT MATTERS

When content is ingested by a media company, the video files are usually transcoded and encrypted and prepared in the formats needed for each target device. A metadata file accompanies the video asset. For various reasons, the same title can be received from multiple content providers over time, or be ingested again from the same content provider.

Metadata consolidation analyses each metadata file that arrives and seeks to match it against the existing metadata catalogue. This process is performed during ingest. If a match is found, the new metadata can be ignored, parts of it can be merged into the existing metadata or the new file can replace the old.

A key objective for metadata consolidation is to avoid creating different metadata files for the same content title and instead create one master file that is accurate and which contains the most complete and relevant information possible. The master file can take the best description from the different metadata versions that are received from different content suppliers over time.

This master metadata file caters for the different language options, and presents the different language synopses and the correct language pack-shot (cover-art and other graphics) as required. The master file can contain different versions of the pack-shot and synopses to suit the device on which the content will be viewed. Thus a laptop will access a longer movie synopsis than a set-top box, and an Apple TV will fetch higher resolution artwork than a smartphone.

A second aim for metadata consolidation, therefore, is to converge television and OTT workflows and so avoid duplicate processing. There should be one master file to serve every



platform and end-device. The consolidation process also seeks to limit the amount of manual intervention that is required by human editors. As far as possible, it should become part of an automated workflow.

Due to a lack of industry standardisation and different levels of maturity in how metadata is handled, metadata files can look very different depending on which studio, production company or broadcaster supplied them. In some instances you receive a spreadsheet with just the content ID, title, cast and crew, and age rating. The hierarchical classification of shows by season and episode can vary.

Metadata consolidation involves a 'clean-up' operation (during the original ingest process) that ensures the master files identify titles in a consistent manner. Viewers will not confront a situation where 'Season 2, Episode 5' is followed by 'Episode 18'. Getting these basics right will make user navigation easier.



METADATA CONSOLIDATION: WHAT IT IS AND WHY IT MATTERS CONTINUED...

HOW METADATA CONSOLIDATION WORKS

To avoid duplication when a new metadata file is received, the content metadata system checks the content ID and will continue to compare different fields from the new metadata file until it can confidently predict that there is a match or no match. After ID, string searches can be made against the title and then against the synopsis.

Fuse Metadata, the next-generation content metadata system from Pikel, provides automated matching and lets users set confidence level thresholds that determine the point at which human editors intervene to decide if the new metadata exists already.

You could, for example, tell the system that if the title and then the key words from the synopsis are the same, this can be automatically confirmed as a match.

Artificial intelligence can be applied to this process, taking into account the accuracy of metadata previously supplied by different content providers. It will be possible for the metadata system to predict a 75% chance of there being a match, or a 95% chance, for instance. Users could even set different thresholds for different categories of content – requiring human intervention sooner when dealing with blockbuster content, but allowing more unsupervised automation for long-tail titles, as an example.

BENEFITS OF METADATA CONSOLIDATION FOR VIEWERS

- No more title duplication in catalogues, so viewers do not have to guess which version to play.
- Viewers are not exposed to title metadata where rights restrictions would prevent them from watching.
- A consistent hierarchy of programming according to season and episodes makes it easier to discover programming and navigate to new titles.
- A consistent user experience between platforms and devices, making services feel more unified.

BENEFITS OF METADATA CONSOLIDATION FOR MEDIA COMPANIES

- Catalogue management is easier.
- Human intervention can be minimised at the point of ingest.
- Metadata function duplication, where efforts are replicated in the broadcast linear and OTT multiscreen worlds, is eliminated.
- By simplifying the metadata workflow you create the conditions for ingesting more titles and expanding content offers.
- If the best practices in metadata are applied consistently across every title, viewers are more likely to rely on their television provider for programme related information and watch more titles.
- Metadata consistency helps services move beyond ‘TV and multiscreen’ and deliver on the promise of ‘one service, all screens’.



METADATA ENRICHMENT: WHAT IT IS AND HOW IT WORKS

Content suppliers (e.g. studios, production companies, broadcasters) are not the only sources of metadata and programming information. Third-parties have supplied the broadcast industry with data for many years and now firms like IMDB and Rotten Tomatoes – which were established as online entertainment information services – license their data to video providers..

Metadata enrichment is where you import data from these third-parties to improve what you have already. At its most basic level, a service provider can run a quality assurance check on metadata they have been given by a content supplier to ensure the release date for a movie is correct. If unsure about the quality of metadata from a production company, an editor can manually compare the supplied synopsis with the synopsis that a third-party offers.

User ratings from IMDB and Rotten Tomatoes can be imported into a master metadata file and presented to consumers of a television service. Other metadata fields can be edited using third-party services. The data is licensed, sometimes based on capped usage levels, sometimes on an ‘all-you-can-eat’ basis. You need to match your content title against the title ID used by the third-party to begin the process.

Enrichment is performed during metadata ingest and runs in parallel to consolidation. It can be automated, with rules established, like a command that user ratings should be added to every new metadata file. Enrichment can also be performed after ingest and rules can state that no title should go live until these checks are completed.

Media companies typically use more than one third-party metadata provider; the integrations are fairly standard via APIs. A local copy of the imported third-party data is held by the media company (e.g. Pay TV operator or broadcaster) and this can be periodically refreshed. The master metadata files refer to this local copy and automatically update themselves whenever the third-party data is updated.

BENEFITS OF METADATA ENRICHMENT

- The accuracy of the information relating to television and movies (like age rating and year of release) is guaranteed.
- Viewers have access to credible, large-sample user ratings as an additional guide to what they should watch.
- ‘Cast and crew’ information and synopses can be expanded, giving people more reasons to watch a title (and just as importantly, more reasons to avoid a title and quickly move on to a better choice).
- Expanded ‘cast and crew’ information provides additional search parameters.
- Television matches the best that the web can offer; super-viewers and younger viewers will appreciate the innovation.





AUGMENTED METADATA: WHAT IT IS AND HOW IT WORKS

Metadata augmentation is the third pillar in a next-generation content metadata system. It relies on the ability to generate new metadata by analysing the video scenes using image recognition and the closed-captions within content. Audio recognition could also be introduced, like identifying background noises such as crashing waves. Augmented metadata is underpinned by machine learning and opens the door to intense innovation in the field of content discovery. The benefits include:

THE CREATION OF MICRO-GENRES

With a better understanding of what happens inside a movie or television programme, video service providers can define content categories more precisely. Instead of presenting a movie as a ‘thriller’ it can become a ‘black-and-white thriller from the 1940s’.

Instead of presenting ‘horror’ as a search option, users can look for ominous, exciting or suspenseful horror. Goofy, witty, dark, understated and deadpan are among the adjectives that can be introduced to help consumers find content that matches their taste and mood.

PRECISE CONTENT SEGMENTATION

Augmented metadata can be created on-the-fly to extract information about who is in a scene and what they are talking about, among other things. Linear television including news, financial news and sport can be chaptered, creating on-demand files that reference subjects that may be of interest to consumers, with start and finish time-stamps.

A metadata file will reference all the different ‘themes’ that emerged from a programme while it was on-air. If someone is interested in ‘fracking’ they can search under this term and find the different shows where it was discussed, then link to the precise moments in the programme when this mining technique was mentioned (give or take a few seconds). Viewers could request an alert whenever fracking is mentioned in new programmes.

PLOT-DNA ANALYSIS

Video DNA means the underlying character of the content plus what happens within a show or movie. Following contextual analysis, the metadata file will be able to list the main themes within the content, the dominant feelings (valence) and even the personality traits of different characters (based on language analysis). Plot-DNA analysis can outline what characters do and what they feel on a frame-by-frame basis, if necessary.

The sentiment within the story can be judged and rated as positive or negative. Other metrics can be applied, like how much control characters have over their situation, all tracked over time to present a complete picture of the plot and its implications.

Because plot-DNA analysis tells you what is happening at any given moment, there is an opportunity for more contextual advertising, like promoting a holiday destination. Dynamic advertising insertion, targeting and programmatic ad buying make it easier for advertisers to exploit an understanding of context in order to increase relevance for their products and brands.

Plot-DNA analysis is part of the process that classifies content within micro-genres and enables new ones to be created.

Piksel has pioneered natural language processing, semantic search, image analysis and machine-learning technologies in order to create proprietary metadata on a scene-by-scene basis.

HOW TO AUGMENT METADATA, HARNESSING MACHINE LEARNING

Closed-captions (or subtitles) can be found in most popular content, providing a transcript of conversations and descriptions of other noise for the benefit of viewers who have hearing impediments. They are a rich source of information when analysing video scenes.

Every video frame is also a still picture - and image analysis can be applied to it, including facial recognition and setting analysis. This is made possible thanks to the latest 'deep learning' algorithms, which are increasingly accurate. For every scene, you can determine who is in the scene and where they are.

A video service provider can decide to analyse every frame or analyse a frame every few seconds, depending on the time accuracy needed when making the scenes searchable.

Scene analysis is the basis for deep-search capabilities. With augmented metadata, viewers can search for an episode of 'Modern Family' where the character Jay was on a golf course. This is only possible by using a combination of facial and scene recognition. The use of subtitle analysis makes even more complex search requests possible, such as: "I want to find the scene in the 'Big Bang Theory' series where Sheldon and Leonard are in a lab talking about the Space Time Continuum"

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Machine learning, including 'deep learning', is an exciting technology that has reached a tipping point due to the computational power now available to run the process. It makes it possible, for instance, to teach a recognition system how to identify an object, like a cat, in the same way that a child learns - by being exposed to countless examples of something that is a cat and something that is not.

Defining a cat by telling an image recognition system that these animals have four legs, a tail and whiskers is less reliable. The first tail-less cat would expose this approach.

Piksel applied machine learning to 4,000 scripted television series from the last 15 years in order to learn about subject clusters in a bid to improve contextual understanding of video. The words 'baby' and 'adoption' are often associated, for example. Word clusters helped to define themes such as 'intra-family relationships' and 'college and education'.

Themes are one of the building blocks for metadata augmentation within Piksel's Fuse Metadata product. Any piece of content and every segment within that content can be ranked according to how high it scores against the different themes that were defined.

The plot-DNA of content, wrapped into a metadatafile, is exposed to the preferred search and recommendation systems via an API.



AUGMENTED METADATA: WHAT IT IS AND HOW IT WORKS CONTINUED...

BENEFITS OF AUGMENTED METADATA

- Because the new metadata is generated using Piksel's proprietary algorithms and is not generally available (whereas other descriptive metadata is available generally), it provides a point of competitive differentiation.
- Netflix is experimenting with new content categorisations and the UK national press has flagged a list of options that include 'Cerebral Experimental Movies' and 'Feel-good Sports Comedies' through to 'Suspenseful Courtroom Movies based on Books'. Service providers have the chance to match or better what 'born-online' rivals do.
- Augmented metadata enables fine-grain search. As simple examples, someone could request a romantic comedy that involves beaches or thrillers that involve car chases. As illustrated in the 'Big Bang Theory' example above, viewers could search on the basis of show + character(s) + location + subject being discussed.
- Better recommendation that takes the plot and mood of content into account. Plot-DNA powered recommendation goes some way beyond collaborative filtering predictions that work on the basis that you watched X and Y, they also watched X and Y, they watched Z too, so you may like Z.
- Content can be quickly and automatically transformed from linear television into segmented (chaptered) on-demand assets. These assets are ready for all platforms and devices.
- New advertising opportunities thanks to a better understanding of the context within shows. This is one of the monetisation pathways created by improved metadata technologies.
- With augmented metadata you can take personal TV to new levels, such as alerts whenever a tagged news subject is mentioned in a show.



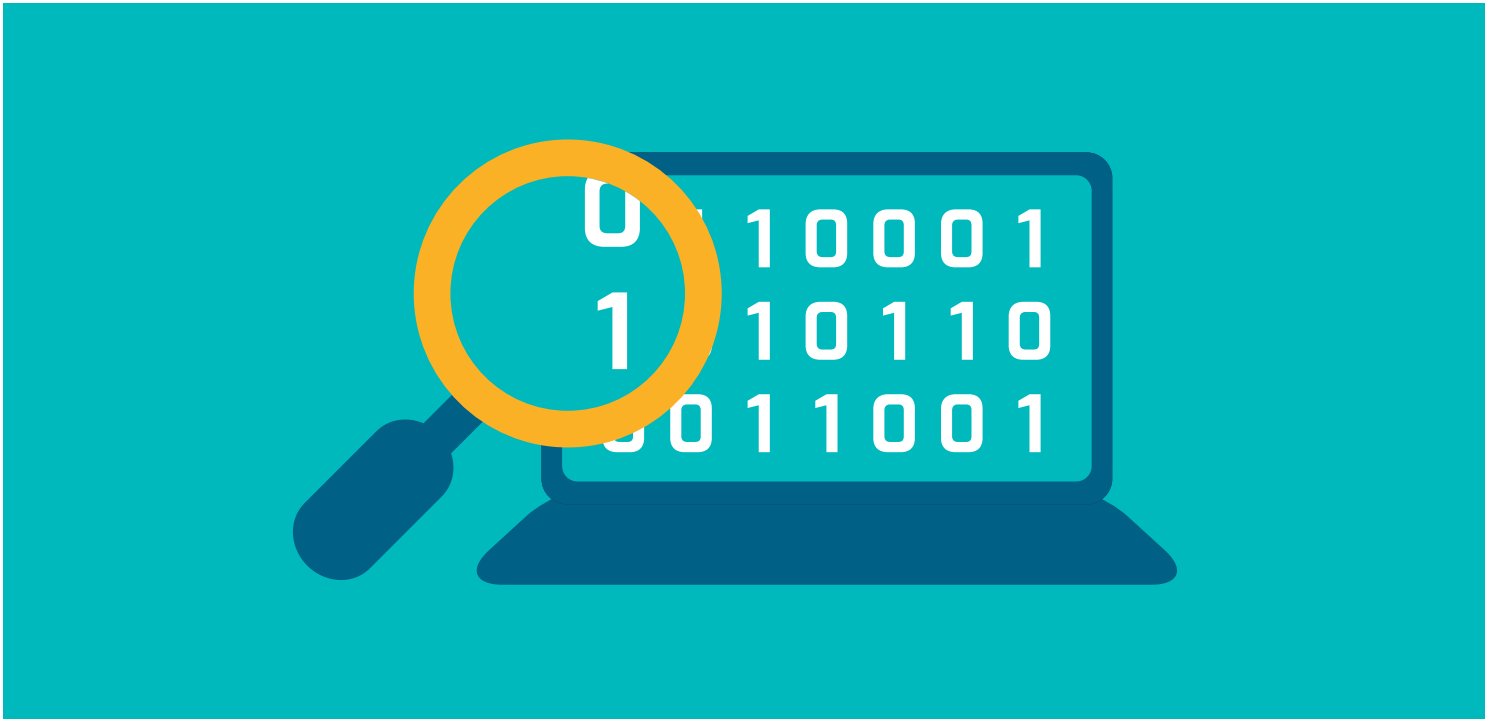
METADATA IS DRIVING NEXT-GENERATION CONTENT DISCOVERY

An advanced content metadata system can become the basis for a dramatic leap forwards in content discovery capabilities. It will help video service providers to clean up their metadata libraries, achieving total consistency and an improved user experience. It eliminates function duplication and wasted resources.

This kind of technology results in a complete, well-organised, rich and unique collection of metadata. Media companies can drive value from their entire catalogue, partly through improved sales rates, and partly from upsell or new subscription opportunities.

For consumers, an advanced content metadata system means more accurate and insightful information about programming, faster discovery, better ways to find content, and a guarantee that what you see is what you get. In addition, on-demand content will be made available to them sooner, and there will be more of it.

An advanced content metadata system powers broadcasters and distributors to create compelling, intuitive user experiences for both their traditional set-top box and digital OTT service offerings, resulting in increased loyalty, service differentiation, increased subscription upsell and reduced churn – ultimately resulting in increased revenue.



References:

(1) Rovi, Cord Cutting Survey, September 2015. Results of an online survey of 4,000 Pay TV and OTT subscribers across the U.S., UK, France, Germany, China, Japan and India, conducted in 2015.





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